

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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## A New Continuous Rolling Mill.

Continuous rolling mills have heretofore either been constructed with rolls in pairs, arranged alternately in horizontal and vertical positions, so as to compress the iron in opposite directions, or with all the rolls in a horizontal position, the iron being conducted from one pair to another by the use of twisted guides. Both of these methods have objectionable features which the mill illustrated is designed to remove. In this mill, which is the invention of W. R. Jenkins, of Bellefonte, Pa., all the rolls are arranged in the same position, the horizontal, of course, being preferred. Its principal novelty consists in the peculiar shape of the rolls, a front view of which is shown at Fig. 1. The top roll, it will be observed, is of a general convex, and the bottom roll of a general concave form, the former having an angular collar or projection, the sides or faces,  $g^1 g^2$ , of which are beveled at an angle of about 45 degrees. Into these faces are turned the grooves  $g^3 g^4$ . As shown in the drawing, one of these is an oval and the other a diamond or gothic shape. A large angular groove is turned into the bottom roll to receive and fit the angular collar of

not shown in the drawing. Fig. 4 is the form of guide used when the roll F, Fig. 1, is placed in the bottom, and is the reverse of Fig. 3 in general design. Fig. 2 is a longitudinal section through a portion of the mill containing two pairs of rolls, and shows the manner of supporting the guides, which is done by means of the rest-bar k, supported in the recesses  $k^1$  of the housings. The guides are provided with lugs, l, which rest against the bar k. The receiving end of the guides rests on the bottom roll in the usual manner.

In a mill of this kind as many pairs of rolls can be used as may be necessary to effect the desired reduction of the iron, the rolls being speeded so as to take up the elongation of the iron from one pair to the next. This system can be adapted to making flats, rounds or squares, but is particularly advantageous in the manufacture of wire rods, where rods of great length are desirable, as it is only governed by the capacity for heating the billet. The output of a mill of this kind in a given time must necessarily exceed that of a train worked by hand. Of course as many pairs of rolls may be used as is necessary to suit any particular requirements, and the same system of roll turning

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At a recent meeting of the Philadelphia Academy of Sciences, Prof. G. A. Koenig exhibited his invention, the

## CHROMOMETER,

an instrument designed for the purpose of making delicate determinations of the presence of certain metals in ores. It is based upon the optical fact that complementary colors extinguish each other if mingled in proper proportions; for instance, if to a green solution a red solution be added, the liquid, if the proper conditions be complied with, will become colorless. Prof. Koenig has applied this principle to the colors which certain metals, as iron, manganese, copper, &c., produce when fused with borax, which is the only chemical used in this method of analysis. He prepares glasses or beads con-

and allowed to drop, which he readily does when dissatisfied with his quarters, but before falling he glues an end of cord to the finger, and then lets himself down easily by gradually spinning it out and hanging by it as it lengthens. The instrument maker catches this cord across his fork, and by turning attaches it to one side; then he goes on turning the fork and advancing it, so that, as the spider continues paying out his cable, a series of obliquely crossing threads are wound upon the fork, which when charged is carefully laid in a box or drawer for use. The elasticity of the iron wire keeps the webs sufficiently stretched, and they are applied to the "stop" by simply laying the fork over it in such wise that one of the stretched webs shall fall upon the mark made on its face. When thus in position a drop of varnish or glue, made by dissolving shellac in alcohol, is let fall upon each side; the spirit rapidly evaporates and the web is fixed.

About eight years ago the city authorities of London offered a prize for the invention of an economical method of

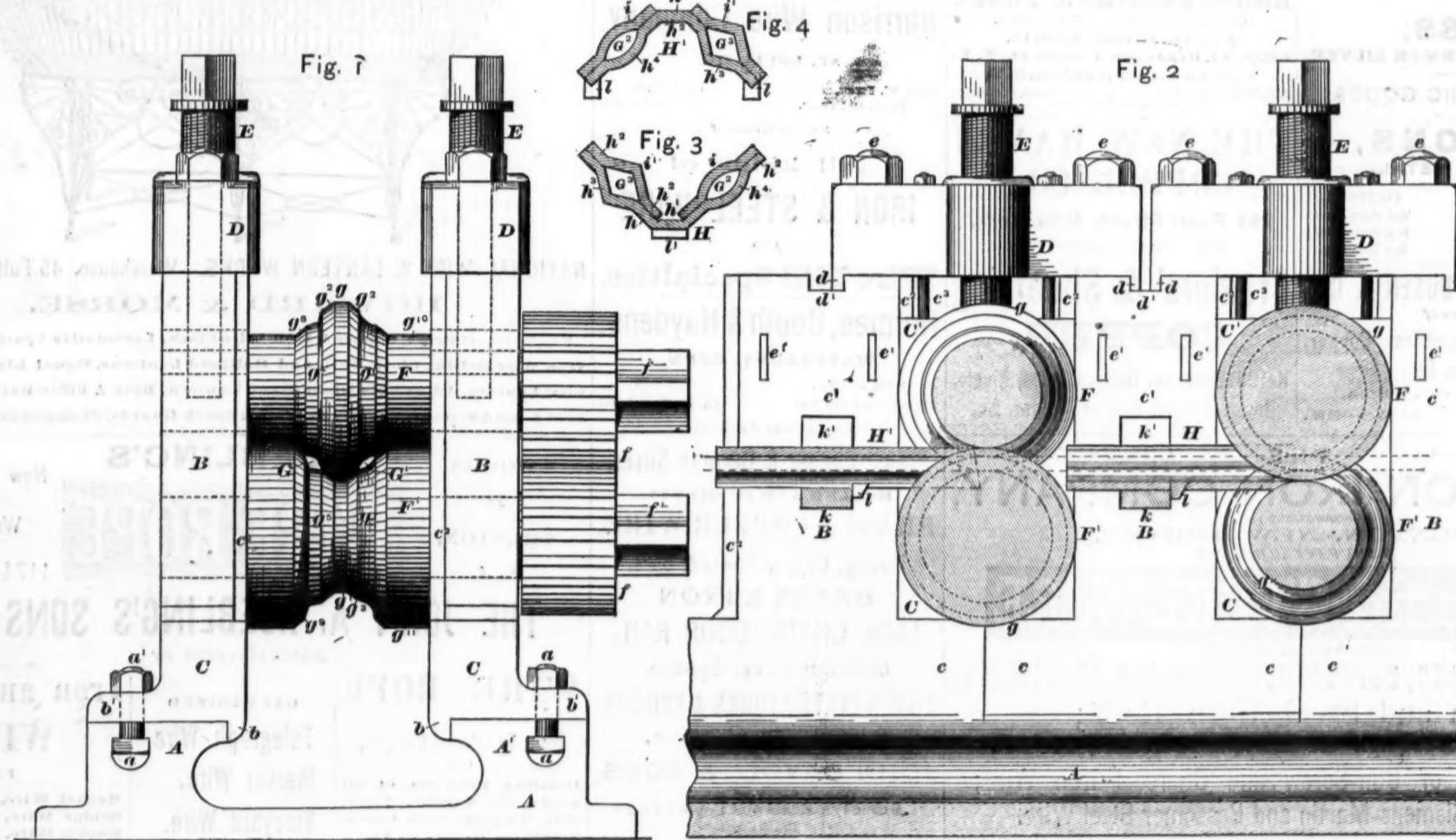
REMOVING SNOW FROM THE STREETS.

Seventeen schemes were submitted. The

## The Chinese in California.

Notwithstanding the refusal of President Hayes to approve the anti-Chinese bill, the Chinese residents in California are likely to find their stay in this country neither pleasant nor profitable, unless they can remove to localities in which they will be treated with more consideration. As showing the spirit which actuates the people of the Pacific Coast, we quote the following sections from the proposed new Constitution of California, as approved by the Convention:

Section 1. The Legislature shall prescribe necessary regulations for the protection of the State, and the counties, cities and towns thereof, from the burdens and evils arising from the presence of aliens who are or who may become vagrants, paupers, medics, criminals, or invalids afflicted with contagious or infectious diseases, and aliens otherwise dangerous or detrimental to the well-being or peace of the State, and to impose conditions upon which such persons may reside in the State, and to provide the means and mode of their removal from the State upon failure or refusal to comply with



JENKINS'S NEW CONTINUOUS ROLLING MILL.

the top roll, the sides or faces of this groove being inclined at the same angle as the sides of the top roll. Into these sides are turned the grooves  $g^3 g^4$ , to match the grooves  $g^1 g^2$  in the top roll, thus forming two complete passes, the longer axis, of which are inclined upward and outward at about an angle of 45 degrees. Supposing this to be the first pair of a train, the second pair would be arranged with the rolls reversed, the roll F would be the bottom, and  $F'$  the top roll. Thus the bevel faces would incline downward and outward at the same angle as the preceding pair, so that the longer axis of the grooves or passes G and  $G'$  in one pair, would be at right angles to the longer axis of the grooves in the preceding or following pair, the tendency of the iron to fan being counteracted, without twisting or turning the iron or reversing the position of the rolls. Another advantage gained by this form of roll is that the practical difficulty encountered in adjusting the roll endwise is obviated. The rolls are placed loosely in their bearings, and all adjustment, both horizontally and vertically, is accomplished by means of the top screws E. As it is evident that as soon as the iron enters the groove  $G^1$  the rolls will be forced apart in the direction of the bevel on the opposite face, there is no end thrust whatever on the brasses.

In Fig. 1, A represents the bed-plate, B the housing, C the base of the housing and D the cap; f and  $f'$  are wabblers or couplers. Figs. 3 and 4 are cross sections, showing the form of guides used in this mill—Fig. 3 being the form used when the roll F, Fig. 1, is placed in the bottom. This guide has a body, H, having the same form in section as the indented portion of the roll. It is fitted with lids or caps  $i^1$  and  $i^2$ , forming grooves or passages  $G^1$  and  $G^2$ , corresponding to the grooves  $g^1$  and  $g^2$  in the rolls. These lids are bolted to the body of the guides by bolts

## Scientific and Technical Notes.

Mr. B. Harras, of Boehlen, Germany, gives the following recipe for making

### IMITATION IVORY.

Dissolve 100 parts of glue in 1000 parts of water, and 50 parts of alum in the same quantity of water, and mix 50 parts of cellulose in 3500 parts of water; 75 parts of the solution of glue, 200 parts of the paste of cellulose, 250 parts of finely ground gypsum, 200 parts of alum solution, and 100 parts water are thoroughly mixed, and the mass is then filled into metal forms carefully coated with lard. It is covered with linen, the superfluous water is drained off, and then it is allowed to solidify. As soon as the article is taken out of the mold it is washed with hot water, dried and soaked with a hot mixture of equal parts of wax and stearine. After cooling it is brushed until it has the proper luster.

According to *Dingler's Poly. Journal*, A. Mueller, of Cologne, Germany, has invented a novel

### ROTATING STEAM ENGINE.

He connects a number of turbines in a common casing, their diameters increasing gradually. The steam enters the smallest and escapes from the largest. The machine is said to be very economical.

Prof. D'Auria describes, in the *Journal of the Franklin Institute*, an

can be adapted to make flats as well as guide iron. There is a mill in operation consisting of eight pairs of rolls, which reduces 1½-inch billets to half-inch square. The iron is finished in rolls separate from the continuous train. We are assured that the practicability of this invention has been demonstrated, and that it gives promise of proving of value to the iron and steel interests of the country.

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### ELECTRIC LIGHTS FOR SHIPS.

The parabola reflector is used for head-light purposes, and, necessarily, the light must be kept directly opposite the focus of the reflector. But as the lower carbon burns away, in the course of time the light would drop lower than the focus of the reflector, and thus spoil the effect. This prevents the use of electricity for head-light purposes at present. The company, however, are arranging for an automatic instrument that will force the lower carbon up as it burns, and thus keep it in the center of the reflector. By this means the company hope to be soon able to use the light at sea.

Prof. W. Mattieu Williams, in a lecture before the London Society of Arts, gives a description of the method of procuring the fine

HAIR LINES OR WEBS FOR TELESCOPES.

The webs are secured for use and storage by making a fork of iron wire, 4 or 5 inches

long and 1½ to 2 inches between the bifurcations. The spider is held in the left hand

such conditions; provided, that nothing contained in the foregoing shall be construed to impair or limit the power of the Legislature to pass such police laws or other regulations as it may deem necessary.

Section 2. No corporation now existing or hereafter formed under the laws of this State shall, after the adoption of this Constitution, employ, directly or indirectly, in any capacity, any Chinese or Mongolian. The Legislature shall pass such laws as may be necessary to enforce this provision.

Section 3. No Chinese shall be employed on any State, county, municipal or other public work, except in punishment for crimes.

Section 4. The presence of foreigners ineligible to become citizens of the United States is declared herein to be dangerous to the well-being of the State, and the Legislature shall discourage their immigration by all the means within its power. Asiatic coolieism, being a form of human slavery, is forever prohibited in this State, and all contracts for coolie labor are null and void. All companies or corporations, whether formed in this country or any foreign country, for the importation of such labor, shall be subject to such penalties as the Legislature may prescribe. The Legislature shall delegate all necessary power to the incorporated cities and towns of this State, for the removal of Chinese without the limits of such cities and towns, or their location within prescribed portions of those limits, and it shall also provide the necessary legislation to prohibit the introduction into this State of Chinese after the adoption of this constitution. This section shall be enforced by appropriate legislation.

The quantity of iron made in Belgium in the first half of 1878 is officially computed at 166,500 tons, as compared with 183,000 tons in the corresponding period of 1877. The number of workmen engaged in the first half of 1878 was 12,700, as compared with 11,700 in the first half of 1877.

The Knights of Labor in Philadelphia are on the point of invoking the law against those proprietors of mills who require boys and girls to work over the regular hours.

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SEE PAGE 9.

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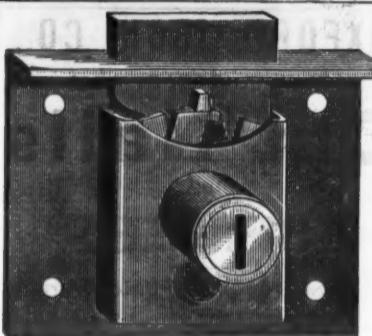
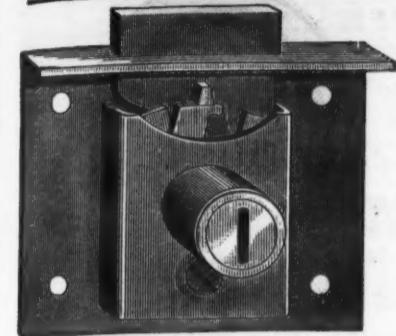
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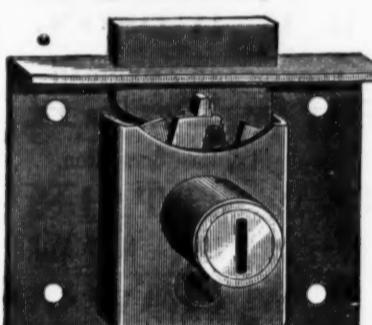
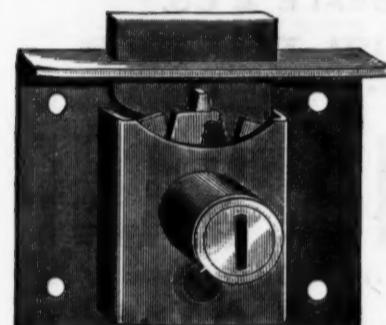
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The Iron Ores of the Lake Superior Region.\*

The missionaries and explorers who visited the south shore of Lake Superior in the beginning of the seventeenth century, were not long in discovering the existence of copper; but they and many generations of their successors failed to note the immense deposits of iron ore of that favored region. It was not until September, 1844, that the United States surveyors, observing the deflection of the needle of their solar compass, and seeking the cause, found the first outcrops of magnetic ore. According to our authority, Prof. Charles D. Lawton (whose contribution on the history of the region we noticed in a recent review of the report of the Commissioners of Statistics of Michigan), the Jackson Mining Company made the first location in the following year, 1845, but it was not until 1846 that the first ore was taken out. Two years later, in 1848, the first iron was made in a forge built on the Carp River. After making its first shipment of 5000 tons in 1856, the company experienced much disappointment and embarrassment, until the beginning of the war created a great demand for iron. Several attempts were made in the earlier days of the district to make iron in bloomeries, both by the Jackson and the Marquette (now the Cleveland) companies, but they invariably proved failures. The first furnace for smelting the ore was the Pioneer, erected in 1850 by the Pioneer Iron Company, subsequently merged into the Iron Cliffs Company. The district, under the impetus of a constantly increasing demand, experienced a wonderfully rapid development, the climax of which was reached in 1873. Since that year the established mining companies have continued producing steadily, until previous figures have been almost reached. The early development of the iron industry was very much aided by the construction of the Sault Sainte Marie Ship Canal, in the years 1853 to 1855, which avoided the Sainte Marie Rapids in the passage between Lakes Superior and Huron, and by the building of the Iron Mountain Railroad from the Jackson and Cleveland mines to the lake, in the years 1855 to 1857. Later, in 1863, the railroad from Negaunee to Escanaba was begun, and in 1872 the Chicago and Northwestern was extended to Escanaba, thus giving the region railroad connection with Chicago.

The rocks of the Upper Peninsula are composed chiefly of the oldest stratified deposits known to geologists—the Laurentian, Huronian and Silurian. The former are principally granites and gneisses, which are probably, in many cases, unconformably covered by the members of the Huronian series. The latter are composed of quartzites, limestones, jaspers, hornblendic rocks, diorites, novaculites, argillites, &c. Major T. B. Brooks has divided the lower Huronian strata—the home of the iron deposits of Michigan—into nineteen members, of which No. XIII is the most important, as containing the hard ores of the State, generally in lenticular masses, which show all the known varieties of the magnetic and red oxides. No. XII, which usually forms the foot wall in the mines, is a red-banded jasper, while No. XIV is a quartzite or quartz conglomerate.

The oldest mine of the region is, as already noted, that of the Jackson Iron Company, who, from remarkably irregular beds, have shipped, in the period from 1856 to 1877, an aggregate of 1,725,533 tons of ore, the highest figure for one single year being that of 1871, with 132,297 tons. The Cleveland Iron Company shares with the former the honor of being the first developed mine of the district, having been incorporated in 1853, and having mined 3000 tons in 1855. The openings on ore are numerous and the beds irregular, the ore being a fine quality of rich specular. Near its No. 9 pit, the company is said to have had one of the largest bodies of ore in the country. The total shipments from the time of discovery to the year 1877, inclusive, were 1,685,392 tons, the largest output for one year being 151,724 tons in 1872, which was equaled, within a few tons, in 1877. The actual working of the New York Mine, the property of S. J. Tilden and W. L. Wetmore, began in 1864 with shipments of 800 tons. For several years it appeared as if there were two independent veins of ore, but at a depth of 100 feet these united in one deposit, which yields a rich specular ore, of which 786,984 tons have been shipped in all, the highest yearly output having been reached in 1870, when 94,809 tons were sold. Since then it has varied, the lowest figure being 55,581 tons in 1877. Another of the old and busy companies of the district is the Lake Superior Iron Company, which began operations in the summer of 1857. The main workings are located on beds the extreme irregularity of which is caused by a complication of folds and faults. They yield a specular slate and granular specular, which, when properly selected, is of the best quality; 1,890,159 tons has been the total product of their mines, the present (1877) output being 127,349 tons. The Barnum yields specular ore from a 13-foot vein, which is beginning to present complicated features. The output has been quite regular since 1869 at about 40,000 tons. A hard and soft hematite, averaging well in iron if properly assorted, and sufficiently low in phosphorus for Bessemer purposes, is taken at the Lake Angeline mine from a deposit varying greatly in thickness. Since 1864, the output has been 445,375 tons. The Salisbury mine works by open pit, a lens having an average width of 35 feet. The ore, a superior quality of soft hematite, was found by Mr. Wright, Commissioner of Statistics, to contain as much as 68.20 per cent. of metallic iron. The mine is of more recent origin having furnished since 1872, 81,247 tons, of which 37,868 tons were mined in 1877.

A number of mines, some of them of importance, may be grouped as belonging to the Saginaw Range. Foremost among them are the developments of the Saginaw Mining Co., who from four shafts sunk on the lay of the vein, the thickness of which fluctuates considerably, extract a hard spec-

lar ore, which varies greatly in texture and structure. If it were not for the expense of handling considerable bodies of water, the cost of extraction would be very low. The mine shipments have aggregated 254,227 tons from 1872 to 1877, inclusive. Soft hematite to the extent of 110,506 tons was taken out of the New England mine up to 1873, when operations were suspended. A more promising working is that of the Section 19 mine of the Lake Superior Mining Company, and the Winthrop Mine, an open pit yielding soft hematite low in phosphorus being 112,832 tons in seven years. Of the other mines, the Foster is worth mentioning, it having produced 100,012 tons in eight years from a vein of 15 feet thickness.

Soft hematites and limonites of good quality, exceptionally low in phosphorus, and occasionally rich in manganese, are mined in the vicinity of Negaunee. The larger mines are the McComber, the Rolling Mill and the New York Hematite, besides which there are the Negaunee, the Hirondale, the Bessemer, the Allen and the Cambria mines. The formation at the McComber mine is very irregular, and it seems that the nature of the ore also varies considerably, there being numerous and often considerable pockets of highly manganeseiferous ore, very low in phosphorus, silica or alumina. An actual trial made at the Munising Furnace proved how well the ore is adapted to the manufacture of spiegel. The company have shipped in all 134,142 tons in eight years. The Rolling Mill mine has the advantage of being very conveniently located for mining and for the transportation of ore, which is a soft hematite and brown ore, carrying no manganese. Since 1871, 158,452 tons have been shipped.

Among the mines which were early sufferers from the effects of the panic of 1873 were those of the Cascade Range, about four miles south of Negaunee, notwithstanding the fact that the deposits seemed inexhaustible and favorably located, and that the ores were of high quality. The noted mines of the range are the Palmer, which in one year previous to the disasters of 1873 reached a production of 41,000 tons of specular ore, the Pittsburgh and Lake Superior, the Carr, the Gibben and the Home.

A mine which has been for a number of years a fair producer of ore, is the Humboldt, formerly the Washington mine. A shaft recently sunk happened to come very near the junction of two lenses of ore—the one magnetic and the other specular—a common phenomenon in the district. Contiguous to the Humboldt is the Edwards, also an old mine. It is the only instance in the region of a mine which has been worked under ground from the beginning. Although at present showing but little ore, the occurrence of the deposits is such that prospecting may at any time reveal new lenses. The mine has shipped in all since 1866, 200,000 tons, half the amount of the output of its neighbor, the Humboldt. The mines of the Champion Company yield magnetite and specular ores, the latter predominating, taken from underground workings. The product of the mine is divided into three classes, the first-class ore being that in which no rock or iron pyrites can be seen. It averages 67 per cent. of metallic iron, while the second-class is only 2 per cent. less. The output had reached 73,000 tons in 1873, but fell to 40,000 in 1874. Since that year a gradual recovery has taken place, and the production in 1877 was 70,883. The Republic mine is located 37 miles west of Marquette. The structure of the deposit is complicated, so that the workings are divided into 14 pits. No. 6 contains a 50-foot vein of nearly pure specular ore, while No. 4 carries, besides a vein of specular, a body of very pure magnetic ore as wide as 40 feet, which gradually narrows in No. 3. In No. 2 is a very interesting deposit of martite—that is, specular ore crystallized after magnetite. It would be impossible to distinguish it from magnetite by its texture; it is but slightly magnetic, and, instead of yielding a black powder, it gives a brownish red streak. The engines of the mine are operated with compressed air instead of steam, the compressors being worked by two Swain turbines, located on the Michigamme River at a distance of 5000 feet from the engine-house. Since the second year of its existence, 1873, the Republic mine has never shipped less than 100,000 tons per annum, the figures reaching 165,836 in 1877. Another mine, working on the same vein, though not a productive one of late years, is the Kloman.

In the Michigamme Range we have first the Michigamme workings, the appointments of which are superior. They produce magnetite high in iron and low in phosphorus, principally from two openings. The ore of the Spurr Mine, taken from a deposit in places 50 feet thick, is well adapted for foundry or mill-iron purposes. Adjoining it is the Steward, which ships but little ore. An isolated mine, which Mr. Wright has found to be better than its fame, is the Silas C. Smith, which yields ore closely resembling the soft specular of the Menominee Range. The same mine produces a peculiar variety of hematite, resembling a bronze-colored putty.

We come next to the mines of the Menominee Range, made accessible recently by the Menominee River Railway. The Emmett Mine has an ore belt consisting of two different varieties—a bluish-colored soft specular on the hanging-wall side of the vein and soft brown ore on the foot-wall side, the former being well adapted to the requirements of steel makers, while the latter will only make foundry iron, a sample showing it to run as high as 0.129 in phosphorus. Adjoining the Emmett is the older Breen mine, which produces soft blue specular from a vein which is rather irregular. Quite a recent mine is the Vulcan, six miles from Waucephah. The vein, which is worked by open cut and a short tunnel, has a lenticular shape and yields ore of good quality adapted for steel purposes. The company operating it, the Menominee Mining Company, have also taken in hand the Norway Mine, of which much is expected for the future. The prospects of the Cyclops, another of the company's mines, are said to be bright, the analyses made hitherto showing low phosphorus and a good average in iron.

The deposits of the Lake Superior district

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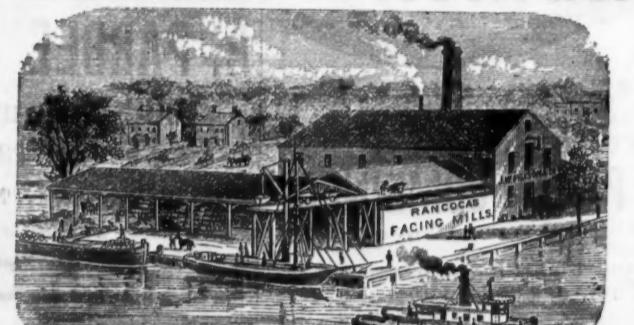
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are subject to many variations, due to folds, faults, slips and "horses." These make the search for, and the mining of, iron ore a matter depending much upon good fortune, and it is hoped, in the interest of the region, that a careful record will be kept of developments made, and that the deposits will be closely and carefully watched. After careful, conscientious study, a competent geologist, like Mr. Wright, will often be in a position to aid and direct both explorations in new districts and dead work in old mines.

Iron and Steel in Shipbuilding.

The London Times has the following valuable article on iron and steel for shipbuilding:

In an interesting paper which he read in May, 1870, before the Iron and Steel Institute, Mr. Charles Mark Palmer, M. P., the eminent shipbuilder, observed: "As iron is far superior to wood, it must be considered the best material for shipbuilding till the manufacture of steel is perfected and that article is produced at a cheap rate. In the meantime, steel can only be used with advantage in exceptional cases. It will be for the members of the Institute to so perfect the use of steel that, while the price shall be comparatively low, the quality shall be uniform. Then the extra strength will doubtless cause it to be generally adopted, both in vessels for the merchant service and in ships of war."

The experience of the last two years has done much to solve this problem. At the close of 1877, for the first time, the rules of Lloyd's Registry for iron ships recognized the greater tenacity of steel. Mr. B. Martell, chief surveyor of Lloyd's, has reported that "mild steel can be manufactured, either by the Bessemer or by the Siemens process, possessing qualities of ductility in connection with tensile strength and general uniformity, which render it much superior to the iron in ordinary use." Mr. W. Boyd of Newcastle-upon-Tyne, has found, after an elaborate series of tests and experiments, that in steel plates "absolute practical uniformity can be relied on, extending over a large quantity of material." Abundance of concurrent testimony points to the same conclusion. Hence, we may regard the cheapness, uniformity and tensile strength of steel plates as placed beyond controversy.

The question thereupon arises, To what extent, and within what period of time, is steel likely to take the place of iron for shipbuilding purposes? It must be admitted that up to the present time steel has not made its way very rapidly in the favor of shipowners. But this was, in its day, equally true of iron. The first iron ship that went to sea—the Aaron Manley, built by the Horley Company, near Birmingham, and put together in London—made her first passage, between London and Paris, in the year 1820. And yet at the end of thirty years from this event, in 1850, the gross total tonnage of British steam vessels, amounting to 275,190 tons, was made up of only 57,361 tons of iron as against 217,829 tons of wood. Ten years later still, and the two materials had entirely changed places. The gross total tonnage of British steam vessels in 1860, amounting to 636,417 tons, was made up of 535,599 tons of iron and only 150,821 tons of wood. In the eight succeeding years the difference was still more remarkable. The total gross tonnage of British steam vessels had increased in 1868 to 1,341,106 tons, composed of 1,218,824 tons of iron and only 122,282 tons of wood. It is, perhaps, not too much to say that the year 1878 marks the same point of departure in reference to the use of steel, that the year 1860 did as regards the use of iron for the purposes of shipbuilding. Although steel has been used off and on for many years, it has not been employed on anything like a commercial scale until quite recently. Up to the year 1870, indeed, only 27,000 tons of shipbuilding, embracing both screw and paddle steamers, had been constructed of steel. This total included a sailing ship of 1200 tons register, which has now been employed as a regular trader for fifteen years, and has in that time given the utmost satisfaction. But until very recently steel was deemed of advantage only in constructing steamers of light draft, and even now, when the cost of steel plates has been largely reduced, and the position of steel is recognized both by the Admiralty and by Lloyd's—the latter by allowing a general reduction of 20 per cent. in the thickness of the plating, framing, &c.—many shipowners hold that the gain in respect of greater carrying power which vessels built of steel plates possess, will be confined to cases where heavy cargoes are regularly obtainable, and that where, as in the majority of cases, the holds are full before the vessel has attained her maximum draft, there is clearly no advantage in preferring steel to iron. Such a view, of course, can only be founded on the problematical assumption that the price of steel for shipbuilding purposes will continue to compare as uniformly with that of iron as hitherto. If the two were brought pretty nearly on all fours, as they are much more likely to be, the advantages of steel would be obvious. In most of the steel vessels constructed up to the present time, the difference of weight has been about two to three—three for iron and two for steel—so that in a ship taking 1200 tons of iron in its construction—by no means an unusual figure—there will be a saving, on this basis, of 400 tons of metal. This is a saving that will go a long way toward compensating for the difference in price as between iron and steel even at the present time; but when that difference has been contracted to the narrow margin that may be confidently looked for at no distant date, there may even be a saving of first cost in the use of steel, to say nothing of the greater endurance of that metal and the enormous gain in carrying capacity resulting from its employment.

That the gradual displacement of iron by steel for shipbuilding purposes can only be a question of time, may, therefore, be regarded almost as certain as that steel has already dispossessed iron of the place it formerly occupied in railway construction.

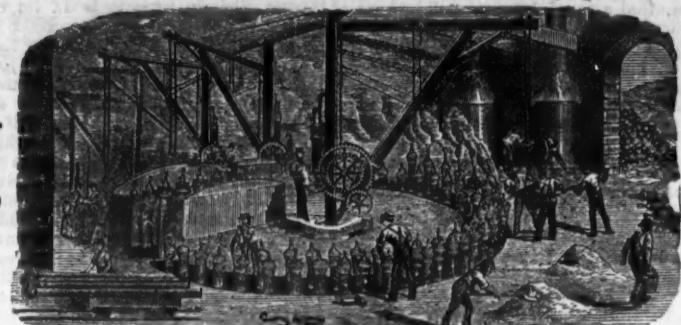
Thirty years ago the plate trade could scarcely be said to have existed. The total production of ship plates in the United

Kingdom did not then exceed 30,000 tons. But between 1860 and 1870 the quantity of iron used in British steam vessels increased from 270,000 tons to 1,700,000 tons, and at the present time the merchant navy of Great Britain represents in its construction considerably over 2,000,000 tons of iron. Mr. Charles Mark Palmer has calculated that between 1850 and 1870 no less than 2,021,109 tons of iron were used in the construction of 3,671,700 tons of shipping, and we shall be within the mark if we calculate that in the eight years which have intervened since this estimate was put forth by one of the most reliable authorities of the day, at least 1,800,000 additional tons of iron have been used for shipbuilding purposes.

At the present time the annual consumption of iron ship plates in Great Britain is not less than 250,000 tons. In the North of England alone the production of plates has increased from 177,000 tons in

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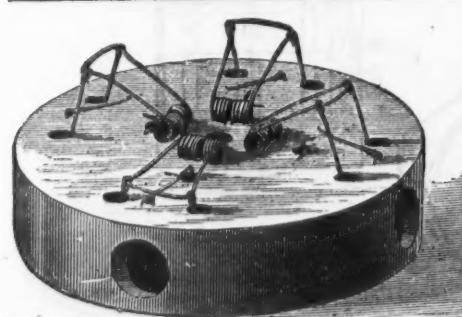
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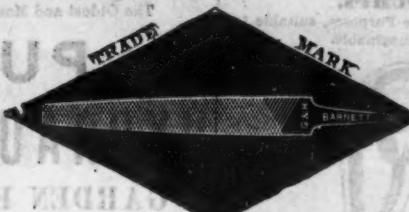
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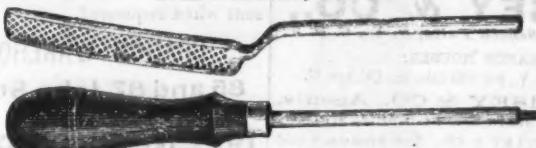
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Inventors, Proprietors and Sole Mfrs. of the  
Duplex Can Opener.

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Automatic Fountain Penholder, Novelty Pen Clip, Self-Locking Door Indicator, and other new and illustrated catalogue and price list upon application.

**PATENT MINERAL WOOL,**  
Entirely fire-proof, undecaying and the best non-conductor of Heat, Cold and Sound. Used extensively for lining steam pipes and boilers, furnaces, cold storage houses, roofs and walls of dwellings, drying kilns, deadening floors of railway passenger cars, &c. **A. D. ELBERS,**  
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Address P. O. Box 4461.

### ANSONIA CORRUGATED STOVE PLATFORM

Manufactured by the

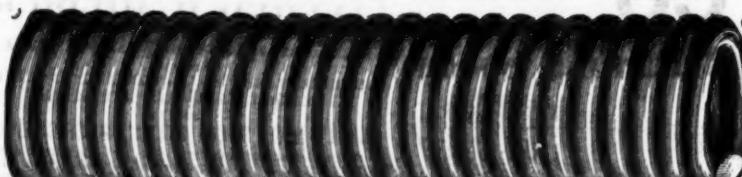
**Ansonia Brass & Copper Co.**  
Office, 19 & 21 Cliff Street,  
NEW YORK.



The Ansonia Corrugated Stove Platform to be the best Platform offered to the trade. As shown in the illustrated section herewith it requires no nailing to keep it in place or to prevent it from turning up at the edge; while the metal is of sufficient thickness to require no lining.

The low price, superior quality and fine finish of this Platform will be readily acknowledged. Packed 24 in a case. **Send for price list.**

### ANSONIA BRASS SPRING WIRE.



The Ansonia Brass Spring Wire is made to combine the qualities of uniformity of temper, great power of resistance and recovery, toughness and accuracy of gauge. Each bundle of wire, before it leaves the works, is subjected to test in a machine which records the deflection and molecular displacement under transverse stress and torsion, and is especially adapted to making spiral springs for mowing and reaping machines, harvesters and for all purposes for which the highest grade of spring wire is required.

### NEW YORK BELTING & PACKING COMP'Y

The Oldest and Largest Manufacturers in the United States

### Vulcanized Rubber Fabrics FOR MECHANICAL PURPOSES.

WAREHOUSE, 37 and 38 Park Row, New York.

### ORIGINAL Solid Vulcanite EMERY WHEELS

LARGE WHEELS MADE ON CAST-IRON CENTER IF DESIRED.

The properties of these Wheels are such that they can be used with great advantage and economy for cutting, grinding, and finishing wrought and cast iron, chilled iron, hardened steel, slate, marble, glass, etc. These Wheels are extensively used by manufacturers of hardware, cutlery, edge tools, plows, safes, stoves, fire arms, wagon springs, axles, skates, agricultural implements, and small machinery of almost every description.

#### PATENT ELASTIC

### Rubber Back Square Packing

BEST IN THE WORLD.

For Packing the Piston Rods &amp; Valve Stems of Steam Engines &amp; Pumps.

B represents that part of the packing which, when in use, is in contact with the piston rod.

A is the elastic back, which keeps the part B against the rod with sufficient pressure to be steam tight, yet creates but little friction.

This packing is made in lengths of about 20 feet, and of all sizes from  $\frac{1}{4}$  to 2 inches square.

JOHN H. CHEEVER, Treasurer.

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See our advertisement in The Iron Age first issue of each month.

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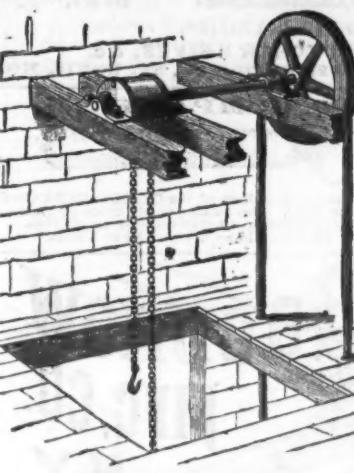
Geo. M. Eddy &amp; Co., Ketcham's Pat. Metallic Sieves.

Measuring Tapes.

#### Weston's Safety Hoists.

Weston's Differential Pulley Blocks are known to engineers and machinists in every part of the world, as an almost indispensable device for the handling of machinery. Although best known by this, his earliest important invention, Mr. Thos. A. Weston is the inventor of numerous other mechanical devices, nearly all of which relate more or less directly to hoisting machinery.

One of the simplest and most generally useful of these is the so-called "Double Lift," illustrated in the accompanying engraving.



WESTON'S "DOUBLE LIFT."

This machine is intended to take the place of the common rope wheel and barrel (whether geared or not) which for centuries has been used for lifting weights to the upper floors of buildings. The improved machine occupies far less space than the old, costs less, is more efficient and safer. The mechanism of one of 500 pounds capacity, complete, weighs only 80 pounds. The hoisting chain is provided with a hook at each end, either of which may at any time be used either for hoisting or lowering. It thus has double the efficiency of a single ended chain or rope, since whenever either hook is at one end of the hoistway the other hook is at the other, and thus a hook is always ready for use, no matter whether the load to be handled be at the top or bottom of the hoistway.

Perhaps the most noticeable feature of it is its safety quality. It holds the load suspended at any point and at all times. To lower the load it is necessary to run the hand rope backwards. The action in doing this is very light and easy, and so long as continued the load will continue to descend. If, however, the backward action of the hand rope be stopped, or if the rope be let go, the load will quietly come to rest, and remain suspended. Accidents from too rapid lowering are thus made absolutely impossible.

These machines have a capacity of 500, 1000, 1500 and 2000 pounds, and are made by the Yale Lock Manufacturing Company, Stamford, Conn. The New York salesroom of this company is at 53 Chambers street. Mr. Weston is now associated with the company as engineer. The price of the 500 pounds machine is \$25, complete. In addition to these machines, the company is manufacturing a large line of hoisting machinery adapted to almost every purpose, and embodying the numerous improvements and devices covered by the inventions of Mr. Weston.

**Preparations for Tunneling the North River.**

Dr. I. I. Hayes, the Arctic explorer, appears in the New York Legislature as the earnest advocate of a general law "to provide for excavating, tunneling and bridging, for transportation purposes, within the villages and cities of this State." The measure has more than ordinary significance, and probably few recognize under the cover of this general act the well-known "Hudson Tunnel Railroad Company," which for several years contended in the courts of New Jersey with the Delaware and Lackawanna Railroad Company, for the right to fix one terminus of its tunnel at the site chosen, and partially excavated, in Jersey City. All legal impediments at that point having been at length overcome, it now only remains to secure similar rights in the State of New York, where the streets are under the exclusive control of the local corporation. The proposed law enables the Tunnel Company to go under the streets, but confers no right to disturb the surface. Depot facilities or other needed accommodations can be acquired by purchase hereafter, in the usual way. Some confusion has arisen from a clause in the bill conferring surface rights, but this feature was retained through inadvertence (the bill having been originally drawn up with reference to a proposed road in Buffalo), and will now be stricken out.

We have seen the gentlemen who are engaged in the tunnel project within the last week, and they claim, with evident truth, to be possessed of ample capital, estimated at some \$10,000,000. They furthermore express themselves as convinced beyond a doubt of the feasibility of the undertaking and its vast prospective commercial importance. Said one of them, who from the outset has been foremost in pushing through the obstacles successively presented: "There are thirteen railway routes terminating at Jersey City and controlling nearly all the trade of the West; all are struggling to reach New York city, the great commercial center, but encounter a barrier at the Hudson River." The Tunnel Company argue further, that through the routes indicated there are now discharged in New York city the passengers and freight received from about 300 trains daily, including a large amount of mail and express matter forwarded by numerous ocean steamers. The transfer across the river between New York and Jersey City, is constantly obstructed by delay incident to reshipment, and especially to the uncertain movement of ferry boats during the fog and ice blockades of winter.

The electric light in the Billingsgate Market, London, has been abandoned. The vendors of the market were much dissatisfied with it, some of them even asserting that the light had the extraordinary effect of changing mackerel into whiting.

The trustees of the British Museum, who excluded gas on account of the danger of fire which it entailed, and were, in consequence, forced to close the doors to visitors during the evening hours, have adopted the electric light.

The company, which now holds itself in readiness for work, intends to construct a tunnel of solid masonry, of sufficient capacity to permit the conveyance of all passengers and freight bound to or from New York city, without change of cars and without delay or hazard.

Of the engineering difficulties to be overcome we have spoken already in these columns, and it is premature to remark further until legislative authority to proceed is fully obtained. In regard to the terminus within New York city, as to the precise location of depots, turn-tables, &c., all is left to the decision of commissioners provided for in the bill of Dr. Hayes, now under consideration. Suffice it to say that opposition is encountered only in the hostility of the Vanderbilt interest, represented by the Hudson River and New York Central Railroad. With this single exception, we are informed, the tunnel is universally approved. On the other hand, without assuming to speak definitely of the views entertained by the various railway corporations who have large investments in New Jersey, it could hardly be expected that innovations upon present arrangements so radical as those now contemplated, would be allowed without at least some show of remonstrance.

The Hudson River Tunnel Company was incorporated under the general railroad laws of the State of New Jersey, May 26, 1873; capital, \$10,000,000. The principal directors were: Trenor W. Park, of the Union Pacific Railroad; De Witt C. Haskin and J. C. Tucker. The other directors were A. B. Gibbs, L. C. Fowler, William Martin and C. Goddard. The original subscribers to the stock were: D. C. Haskin, California; William Martin, New York; Theodore F. Wood, Jersey City; L. C. Fowler, California; George F. Seward, New York; T. W. Park, Vermont; C. Goddard, New York; A. C. Foster, New York; Wm. J. Osborn, New York; C. H. Dearing, New York; G. H. Clows, New York; A. A. Selover, New York; George Miller and John F. Ward, Jersey City, N. J.; Albert B. Gibbs, New York; Wm. M. Force and L. M. Price, Newark, N. J.; J. Tucker, New York; James S. Wethered, Englewood, N. J.; Ira A. Kip, George A. Thayer and David Crocker, New York; James E. Nutman, New Jersey; J. W. Haskins, California; A. S. Roberts, New York. Each of these took 20 shares, with the exception of Theodore F. Wood, who subscribed for one, making 241 shares in all. The remainder of the stock found purchasers in the West, Senator Jones, of Nevada, among others, taking a large share.

Col. W. H. Paine, of the New York Bridge Company, was chosen engineer.

#### Judge Blatchford's Injunction Upon Nickel Plating.

Judge Blatchford, on Monday, the 10th inst., rendered his decision in the case of the United Nickel Company vs. the Manhattan Brass Co., J. H. White, J. H. Crane and H. L. Coo; the same, W. H. Jackson, and others. It will be remembered that voluminous affidavits were made and much testimony, oral and documentary, given before Judge Blatchford, in the United States Circuit Court, a few weeks ago, in behalf of the defendants, Senator Roscoe Conkling delivering the principal address. The court reserved its decision, which has been awaited with deep interest throughout all the trades in which nickel is used.

In the decision now rendered, filling 17 folios of legal cap, Judge Blatchford reviews the whole ground as to the claims made, and the solutions and processes employed. He remarks that the defendants in these suits united with various other nickel platers in their defense of the suit brought by the plaintiffs in the United States Circuit Court against Harris and Weston, and made substantially the same defense and answers. Judge Blatchford decides that the process employed by the defendants gives a coherent, consistent and tenacious coating of nickel; that the means by which this coating is secured are described in Adams' patent of 1869, and that no practical plating can be done unless that process is used.

The opposition to the motion for an injunction was based upon the affidavits of chemical experts, Profs. Seelye, Doremus and others, the object being to establish that the Court reached an erroneous conclusion in the suit against Harris and Weston, and ought to reverse that decision. Judge Blatchford says he has examined the affidavits and testimony, both oral and written, and is unable to see that anything new has been advanced in the evidence and arguments since presented, or that the judgment originally rendered did not advert to all the points now urged for the defense. He reviews at length the testimony of the several chemical experts, and remarks with reference to it that the gist of the argument on their part is that if the first claim under the patent is for the exclusion of sulphates and chlorides, any such claim has not been infringed, and he therefore proceeds to examine with considerable minuteness all that has been said respecting the substance, use and application of various chemicals, many of the observations thus made being too prolix for general comprehension. The patent in question has been sustained in the first and second circuits. The plaintiffs show that they have granted some sixty licenses under it in the States of Massachusetts, Connecticut, New York, Ohio, Pennsylvania, Maryland, Maine and Rhode Island, and that they are willing to grant licenses to responsible manufacturers on fair and equitable terms. They are entitled to be protected in their rights, and preliminary injunctions must issue in the case of the defendants named.

The electric light in the Billingsgate Market, London, has been abandoned. The vendors of the market were much dissatisfied with it, some of them even asserting that the light had the extraordinary effect of changing mackerel into whiting.

The trustees of the British Museum, who excluded gas on account of the danger of fire which it entailed, and were, in consequence, forced to close the doors to visitors during the evening hours, have adopted the electric light.

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## FRIEDMANN &amp; LAUTERJUNG,

Manufacturers of  
PEN AND POCKET CUTLERY,  
Solid Steel Scissors, Shears, Razors, &c.  
Sole proprietors of the renowned full concave patent  
"ELECTRIC RAZORS,"  
And the "ELECTRIC SHEARS." Nickel Plated  
Bows.

Agents for the BENGAL RAZORS.  
AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.  
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The oldest manufacturers of Table Cutlery in America. Exclusive makers of the CELLULOID HANDLE for Table Cutlery. A most beautiful and perfect substitute for Ivory. Also makers of all kinds of TABLE, BUTCHER AND HUNTING KNIVES. Illustrated catalogues with prices sent to the trade on application.

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AARON BURKINSHAW,  
Manufacturer of Pen and Pocket Cutlery, Pepperell, Mass.  
My blades are forged by hand from the best Cast Steel, and warrant-  
ed. To me was awarded the Gold Medal of the Conn. State Agricultural Society.  
Office in New York with E. P. Whipple, 100 Chambers St.

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Manufacturers of FINE PEN & POCKET CUTLERY.  
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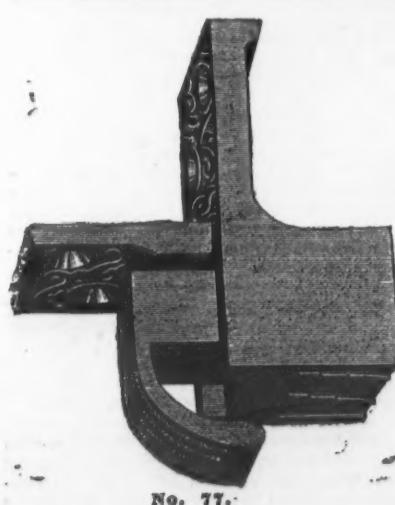
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MANUFACTURERS OF  
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No. 113, Improved Adjustable Circular Plane - - \$4.00



## Door-Jamb Bolts.

These are a decided improvement over either mortise or surface bolts. They are much stronger, quicker handled, more compact, and are not affected by the door settling or warping.

The projection from Bolt with its anchor is let into the face of the jamb, secured by heavy screws, and the square frame of the bolt is let into the edge of the casing. The small plate is pushed out over the edge of the door, and the bolt is pushed out over it.

If by accident the bolt is pushed out when the door is open, it will be thrown back by the door in closing.

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Extensively used and the only reliable machine for close clipping. Simple in operation and finishes the work in short time.

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Table Knives, Razors, Shovels, &c., &c.,  
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Granted 1749.

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No. 411 Commerce St., PHILADELPHIA  
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"Limited,"  
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## Isaac Greaves'

## Best Cast Steel

## SHEEP SHEARS.

Equal to any in quality and finish, and lower in price. Same numbers, styles and list as Wilkinson's.



We also attach to these Shears the  
PATENT GUARD POINT,  
of which we have exclusive control. This is a great  
improvement. It effectively prevents sticking  
and cutting the sheep, and enables the operator  
to shear faster and smoother.

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GENERAL HARDWARE MERCHANTS,  
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BALL'S PAT. SOLID STEEL SHEEP SHEARS.

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CELEBRATED CUTLERY,

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F. & W. CLATWORTHY, Agents.

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Having largely increased our facilities for the manufacture of these very popular goods, we offer them to the trade at a large reduction from our former prices. The list price of the large size is now \$12.00 per dozen, formerly \$15.00, and the small size, formerly \$8.00. The material used in the manufacture of Young's Patent Folding Scissors is the very best. All are nickel-plated and furnished with a neat morocco case.

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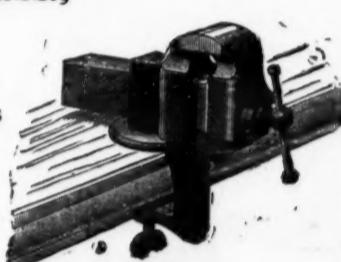
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Special quotations for export.MANUFACTURERS  
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Every variety of Meats,  
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Used on any STOVE,

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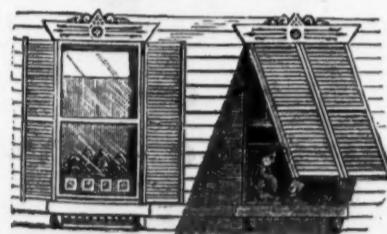
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Either old or new Blinds thus fitted can  
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Any Required Diameter or Length.



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New York.

### The Huntsman Family and Cast Steel.

On the evening of February 20th ult., Mr. Francis Huntsman died at his home, near Doncaster, England, at the venerable age of 95. The deceased gentleman was a member of a family of which Sheffield has just cause to be proud, for it is to the invention of cast steel by Mr. Huntsman's grandfather that the town owes its present position. Mr. Francis Huntsman carried on business in conjunction with his son in Church street, Attercliffe, but he has not of late years taken a very active part in the management, in consequence of old age. He was scrupulously honest and straightforward in all his dealings. In his business he took care that the manufactures he turned out should worthily sustain the high name the firm had attained. Though he inherited from his father the secret of the manufacture of cast steel, yet he had wonderfully improved on the invention, and the article he turned out had a world-wide reputation. The deceased gentleman leaves one son—Mr. Benjamin Huntsman, of Retford—by whom, with his son, Mr. Francis Huntsman, the business will still be carried on. His wife died some ten years ago.

Samuel Smiles, in his volume of "Industrial Biography" devoted to iron masters and tool makers, gives the following account of the invention of cast steel, which is probably authentic, and will be read with interest in connection with the news of Francis Huntsman's death:

The invention of cast steel is due to Benjamin Huntsman, of Attercliffe, near Sheffield. M. Le Play, Professor of Metallurgy in the Royal School of Mines of France, after making careful inquiry and weighing all the evidence on the subject, arrived at the conclusion that the invention fairly belongs to Huntsman. The French professor speaks of it as a "memorable discovery," made and applied with admirable perseverance; and he claims for its inventor the distinguished merit of advancing the steel manufactures of Yorkshire to the first rank, and powerfully contributing to the establishment on a firm foundation of the industrial and commercial supremacy of Great Britain. It is remarkable that a French writer should have been among the first to direct public attention to the merits of this inventor, and to have first published the few facts known as to his history in a French government report—showing the neglect which men of his class have heretofore received at home, and the much greater esteem in which they are held by scientific foreigners.\* Le Play, in his enthusiastic admiration of the discoverer of so potent a metal as cast steel, paid a visit to Huntsman's grave in Attercliffe Churchyard, near Sheffield, and from the inscription on his tombstone recites the facts of his birth, his death and his brief history. With the assistance of his descendants, we are now enabled to add the following record of the life and labors of this remarkable, but almost forgotten man: :

Benjamin Huntsman was born in Lincolnshire in the year 1704. His parents were of German extraction, and had settled in this country only a few years previous to his birth. The boy being of an ingenious turn, was bred to a mechanical calling; and becoming celebrated for his expertise in repairing clocks, he eventually set up in business as a clock maker and mender in the town of Doncaster. He also undertook various other kinds of metal work, such as the making and repairing of locks, smoke-jacks, roasting-jacks and other articles requiring mechanical skill. He was remarkably shrewd, observant, thoughtful and practical; so much so, that he came to be regarded as the "wise man" of his neighborhood, and was not only consulted as to repairs of machinery, but also of the human frame. He practiced surgery with dexterity, though after an empirical fashion, and was held in especial esteem as an oculist. His success was such that his advice was sought in many surgical diseases, and he was always ready to give it, but declined receiving any payment in return.

In the exercise of his mechanical calling he introduced several improved tools, but was much hindered by the inferior quality of the metal supplied to him, which was common German steel. He also experienced considerable difficulty in finding a material suitable for the spring and pendulum of his clocks. These circumstances induced him to turn his attention to the making of a better kind of steel than was then procurable, for the purposes of his trade. His first experiments were conducted at Doncaster; but as fuel was difficult to be had at that place, he determined, for greater convenience, to remove to the neighborhood of Sheffield, which he did in 1740. He first settled at Hamsorth, a few miles to the south of that town, and there pursued his investigations in secret. Unfortunately, no records have been preserved of the methods which he adopted in overcoming the difficulties he had necessarily to encounter. That they must have been great is certain, for the process of manufacturing cast steel of a first-rate quality, even at this day, is of a most elaborate and delicate character, requiring to be carefully watched in its various stages. He had not only to discover the fuel and flux suitable for his purpose, but to build such a furnace and make such a crucible as should sustain a heat more intense than any then known in metallurgy. Ingots had not yet been cast, nor were there hoops and wedges made that would hold them together; nor, in short, were any of those materials at his disposal which are now so familiar at every melting furnace.

Huntsman's experiments extended over many years before the desired result was achieved. Long after his death, the memoirs of the numerous failures through which he toilsomely worked his way to success

\* M. Le Play's two elaborate and admirable reports on the manufacture of steel, published in the *Annales des Mines*, Vols. III and IX, 4th series, are unique of their kind, and have as yet no counterpart in English literature. They are respectively entitled, "Mémoire sur la Fabrication de l'Acier en Yorkshire," and "Mémoire sur la Fabrication et le Commerce des Fers & Acier dans le Yorkshire."

† There are several clocks still in existence in the neighborhood of Doncaster made by Benjamin Huntsman; and there is one in the possession of his grandson, with a pendulum made of cast steel. The manufacture of a pendulum of such a material at that early date is certainly curious; its still perfect spring and elasticity showing the scrupulous care with which it had been made.

were brought to light, in the shape of many hundredweights of steel, found buried in the earth in different places about his manufactory. From the number of these wrecks of early experiments, it is clear that he had worked continuously upon his grand idea of purifying the raw steel then in use, by melting it with fluxes at an intense heat in closed earthen crucibles. The buried masses were found in various stages of failure, arising from imperfect melting, breaking of crucibles and bad fluxes, and had been laid away as so much spoiled steel of which nothing could be made. At last his perseverance was rewarded and his invention perfected; and although a hundred years have passed since Huntsman's discovery, the description of fuel (coke) which he first applied for the purpose of melting the steel, and the crucibles and furnaces which he used, are, for the most part, similar to those in use at the present day. Although the making of cast steel is conducted with greater economy and dexterity, owing to increased experience, it is questionable whether any maker has since been able to surpass the quality of Huntsman's manufacture.

The process of making cast steel, as invented by Benjamin Huntsman, may be thus summarily described: The melting is conducted in clay pots, or crucibles, manufactured for the purpose, capable of holding about 34 pounds each. Ten or twelve of such crucibles are placed in a melting furnace similar to that used by brass founders, and when the furnace and pots are at a white heat, to which they are raised by a coke fire, they are charged with bar steel, reduced to a certain degree of hardness, and broken into pieces of about a pound each. When the pots are all thus charged with steel, lids are placed over them, the furnace is filled with coke and the cover put down. Under the intense heat to which the metal is exposed, it undergoes an apparent ebullition. When the furnace requires feeding, the workmen take the opportunity of lifting the lid of each crucible and judging how far the process has advanced. After about three hours' exposure to the heat, the metal is ready for "teeming." The completion of the melting process is known by the subsidence of all ebullition, and by the clear surface of the melted metal, which is of a dazzling brilliancy, like the sun when looked at with the naked eye on a clear day. The pots are then lifted out of their place, and the liquid steel is poured into ingots of the shape and size required. The pots are replaced, filled again, and the process is repeated; the red-hot pots thus serving for three successive charges, after which they are rejected as useless.

When Huntsman had perfected his invention, it would naturally occur to him that the new metal might be employed for other purposes besides clock-springs and pendulums. The business of clock-making was then of a very limited character, and it could scarcely have been worth his while to pursue so extensive and costly a series of experiments merely to supply the requirements of that trade. It is more probable that at an early stage of his investigations he shrewdly foresaw the extensive uses to which cast steel might be applied in the manufacture of tools and cutlery of a superior kind; and we accordingly find him early endeavoring to persuade the manufacturers of Sheffield to employ it in the manufacture of knives and razors. But the cutlers obstinately refused to work a material so much harder than that which they had been accustomed to use; and for a time he gave up all hopes of creating a demand in that quarter. Foiled in his endeavors to sell his steel at home, Huntsman turned his attention to foreign markets; and he soon found he could readily sell abroad all he could make. The merit of employing cast steel for general purposes belongs to the French, always so quick to appreciate the advantages of any new discovery, and for a time the whole of the cast steel that Huntsman could manufacture was exported to France.

When he had fairly established his business with that country, the Sheffield cutlers became alarmed at the reputation which cast steel was acquiring abroad; and when they heard of the preference displayed by English as well as French consumers for the cutlery manufactured of that metal, they readily apprehended the serious consequences that must necessarily result to their own trade if cast steel came into general use. They then appointed a deputation to wait upon Sir George Savile, one of the members for the County of York, and requested him to use his influence with the government to obtain an order to prohibit the exportation of cast steel. But on learning from the deputation that the Sheffield manufacturers themselves would not make use of the new steel, he positively declined to comply with their request. It was indeed fortunate for the interests of the town that the object of the deputation was defeated, for at that time Mr. Huntsman had very pressing and favorable offers from some spirited manufacturers in Birmingham to remove his furnaces to that place; and it is extremely probable that, had the business of cast-steel making become established there, one of the most important and lucrative branches of its trade would have been lost to the town of Sheffield.

The Sheffield makers were, therefore, under the necessity of using the cast steel, if they would retain their trade in cutlery against France; and Huntsman's home trade rapidly increased. And then began the efforts of the Sheffield men to wrest his secret from him; for Huntsman had not taken out any patent for his invention, his only protection being in preserving his process as much a mystery as possible. All the workmen employed by him were pledged to inviolable secrecy; strangers were carefully excluded from the works; and the whole of the steel made was melted during the night. There were many speculations abroad as to Huntsman's process. It was generally believed that his secret consisted in the flux which he employed to make the metal melt more readily; and it leaked out among the workmen that he used broken bottles for the purpose. Some of the manufacturers, who, by prying and bribing, got an inkling of the process, followed Huntsman implicitly in this respect; and they would not allow their own workmen to flux the pots, lest they also should

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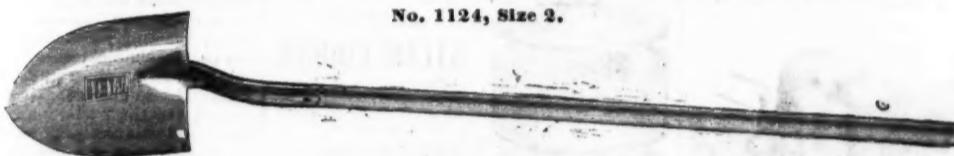
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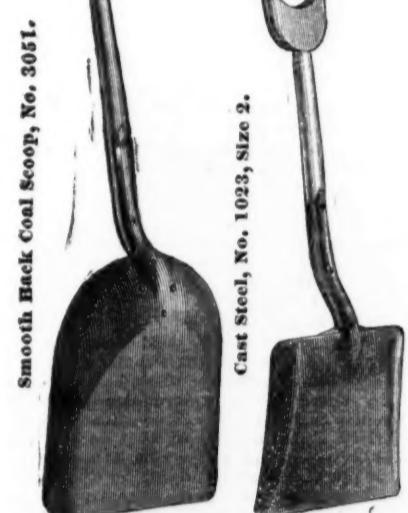
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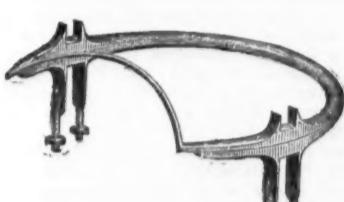


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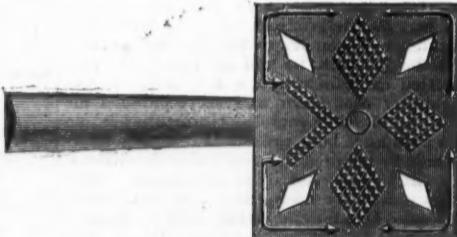


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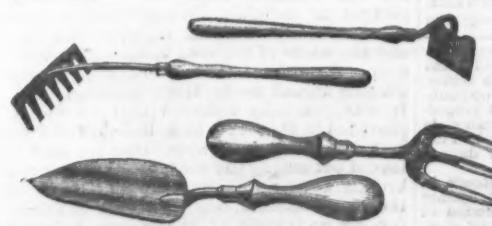
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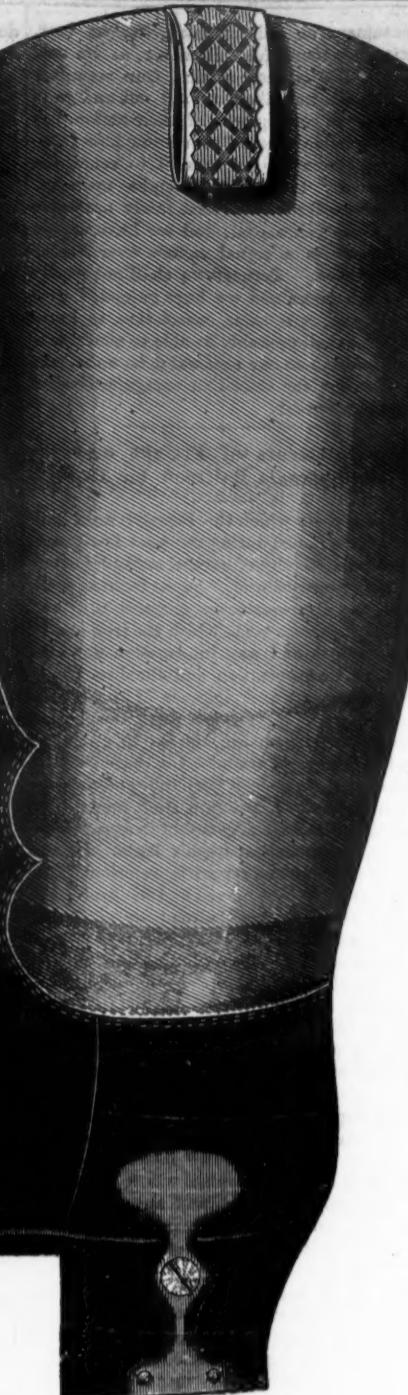
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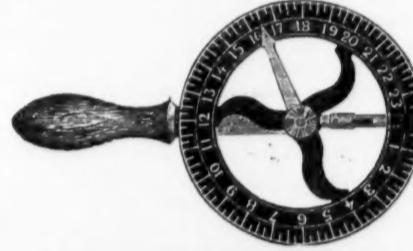
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We are informed that a mirror is still preserved at Attenciffle, made by Huntsman in the

days of his early experiments.

Annals des Mines, Vol. IX, 4th Series, 266.

obtain possession of the secret. But it turned out eventually that no such flux was necessary, and the practice has long been discontinued. A Frenchman named Jars, frequently quoted by Le Play in his account of the manufacture of steel in Yorkshire, paid a visit to Sheffield toward the end of last century, and described the process so far as he was permitted to examine it. According to his statement, all kinds of fragments of broken steel were used; but this is corrected by Le Play, who states that only the best bar-steel, manufactured of Dannemora iron, was employed. Jars adds that "the steel is put into the crucible with a flux, the composition of which is kept secret," and he states that the time occupied in the conversion was five hours.

It is said that the person who first succeeded in copying Huntsman's process was an iron founder named Walker, who carried on his business at Greenside, near Sheffield; and it was certainly there that the making of cast-steel was next begun. Walker adopted the "ruse" of disguising himself as a tramp, and, feigning great distress and abject poverty, he appeared, shivering, at the door of Huntsman's foundry late one night when the workmen were about to begin their labors at steel-casting, and asked for admission to warm himself by the furnace fire. The workmen's hearts were moved, and they permitted him to enter. We have the above facts from the descendants of the Huntsman family; but we add the traditional story preserved in the neighborhood, as given in a well-known book on metallurgy:

"One cold winter's night, while the snow was falling in heavy flakes, and the manufactory threw its red glare of light over the neighborhood, a person of the most abject appearance presented himself at the entrance, praying for permission to share the warmth and shelter which it afforded. The humane workmen found the appeal irresistible, and the apparent beggar was permitted to take up his quarters in a warm corner of the building. A careful scrutiny of the stranger, for he eagerly watched every movement of the workmen while they went through the operations of the newly discovered process. He observed, first of all, that bars of blistered steel were broken into small pieces, two or three inches in length, and placed in crucibles of fire-clay. When nearly full, a little green glass broken into small fragments was spread over the top, and the whole covered over with a closely fitting cover. The crucibles were then placed in a furnace previously prepared for them; and after a lapse of from three to four hours, during which the crucibles were examined from time to time to see that the metal was thoroughly melted and incorporated, the workmen proceeded to lift the crucible from its place on the furnace by means of tongs, and its molten contents, blazing, sparkling and spouting, were poured into a mold of cast iron previously prepared; here it was suffered to cool, while the crucible was again filled and the process repeated. When cool, the mold was unscrewed and a bar of cast steel presented itself, which only required the aid of the hammerman to form a finished bar of cast steel. How the unauthorized spectator of these operations effected his escape without detection, tradition does not say; but it tells us that, before many months had passed, the Huntsman Manufactory was not the only one where cast steel was produced."

However the facts may be, the discovery of the elder Huntsman proved of the greatest advantage to Sheffield, for there is scarcely a civilized country where Sheffield steel is not largely used, either in its most highly finished forms of cutlery or as the raw material for some home manufacture. In the mean time the demand for Huntsman's steel steadily increased, and in 1770, for the purpose of obtaining greater scope for his operations, he removed to a large, new manufactory which he erected at Attenciffle, a little to the north of Sheffield, more conveniently situated for business purposes. There he continued to flourish for six years more, making steel and practicing benevolence: for, like the Darbys and Reynolds of Coalbrookdale, he was a worthy and highly respected member of the Society of Friends. He was well versed in the science of his day and skilled in chemistry, which doubtless proved of great advantage to him in pursuing his experiments in metallurgy. That he was possessed of great perseverance will be obvious from the difficulties he encountered and overcame in perfecting his valuable invention. He was, however, like many persons of strong original character, eccentric in his habits and reserved in his manner. The Royal Society wished to enroll him as a member, in acknowledgment of the high merit of his discovery of cast steel, as well as because of his skill in practical chemistry; but as this would have drawn him in some measure from his seclusion, and was also, as he imagined, opposed to the principles of the society to which he belonged, he declined the honor. Mr. Huntsman died in 1776, in his 72d year, and was buried in the church-yard at Attenciffle, where a gravestone with an inscription marks his resting place.

His son continued to carry on the business, and largely extended its operations. The Huntsman mark became known throughout the civilized world. Le Play, the French professor of metallurgy, in his "Mémoire" of 1846, still speaks of the cast steel bearing the mark of "Huntsman and Marshall" as the best that is made, and he adds: "The buyer of this article, who pays a higher price for it than for other sorts, is not acting merely in the blind spirit of routine, but pays a logical and well-deserved homage to all the material and moral qualities of which the true Huntsman mark has been the guarantee for a century."

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AND  
Metallurgical Review.

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It has been announced by telegraph, under date of the 14th instant, that Messrs. Bolckow, Vaughan & Co. have been successful in making steel from Cleveland pig iron. If verified, this will be of the utmost importance to that district, where the facilities for making cheap iron are exceptional, but which is unfortunately dependent upon ores containing a high percentage of phosphorus. A solution of the problem, which has been so carefully and intelligently studied in the Cleveland district, would be welcome news to many American ironmasters. It is generally known that Messrs. Bolckow, Vaughan & Co. have been constantly experimenting of late years, and it has been stated by English exchanges, as we noted in a recent issue of *The Iron Age*, that the process submitted to experimental test was that of Messrs. Thomas & Gilchrist, first tried at Blaenavon, later at Thy-le-Chateau, and still later at the Acklam Works. So far as can be gathered from published accounts, this process is based

upon the use of a magnesian limestone, suitably prepared as a lining for the Bessemer converter, and upon the effect of basic additions in eliminating phosphorus. What the precise conditions for success are, how far that success has been actually achieved experimentally, and whether the process used will stand the severe test of continuous work on a large scale, are questions which can only be answered after fuller information has been received than is likely to come by cable. The subject is one which has especial interest just now for the American iron trade, and we shall give our readers all the trustworthy information obtainable.

## The Canadian Tariff.

On another page of this issue we give an abstract of the new tariff submitted last week to the Dominion Parliament, with extracts from the speech of Mr. Tilley, in which he makes certain references to the relations of Canada to the United States. As the copy of the text of the bill from which our abstract is made was in very bad shape and full of obvious errors, we are not quite sure that some of those not so obvious have not crept into our table. This is less important, however, than it would be if the bill had been revised. Its reception by Parliament seems to have been generally favorable, but when the "log rolling" begins and the members buckle down to the practical business of taking care of their constituents, it is not improbable that the bill will be so changed and amended that its framers will have difficulty in recognizing it. In its present shape it is of little value beyond giving an indication of the views of the ministry, which may be supposed to reflect to some extent the demands of the delegations which have had hearings at Ottawa.

Examining the items, it appears that some effort has been made to carry out the principle of protecting manufacturers, while giving them the benefit of cheap raw materials. The difficulty here encountered is to say where the line between raw materials and manufactures shall be drawn. For example, pig iron is taxed \$2 per ton. There is no protection in that figure against American competition. Blooms, billets, slabs and lumps are taxed 12½ per cent. *ad valorem*, while bar iron of all shapes and sizes, bands, hoops, sheets (black and galvanized), boiler plates, nail rods, &c., are taxed 17½ per cent. *ad valorem*. These are all the raw materials of certain important industries, but they are the finished products of other industries equally important. Consequently, we find them straddling the line about midway between the free list and the highest duties named. Wire rods are not protected at 10 per cent., nor are rails at 15 per cent. The duty on wire (25 per cent.) will probably make its manufacture profitable. So will the 25 per cent. duty on stoves and other finished castings. Duties ranging from 25 to 35 per cent. on such manufactures as scales, wood screws, bolts and nuts, hollow-ware, and builders', saddlers' and undertakers' hardware, are protective. Lead is taxed 10 per cent., and manufactures of lead from 20 to 25 per cent. Nearly all the more important manufactures of brass are taxed 10 per cent., but a rate of 30 per cent. is established for those "not otherwise specified." Machinery, except for bookbinders' and printers' use, is taxed 25 per cent. Steel, unmanufactured, is taxed 10 per cent., but most manufacturers of steel are put in the 30 per cent. class. These items are sufficient to show the scheme of the bill, so far as it relates to the classes of products and manufacturers of especial interest to our readers. The free list is pretty large, and will probably excite some opposition.

As a revenue measure, this bill, if passed in anything like its present shape, is likely to be a success, but we venture to predict that it will prove a disappointment as regards its effects upon the industrial prosperity of the Dominion. The people of the United States have no reason to quarrel with the people of Canada in this matter, since they are actuated mainly by a desire to imitate the policy of the American government, in the hope of effecting thereby an industrial development in some degree proportionate to that which protection effected in this country during the ten years from 1860 to 1870. It must be remembered, however, that while like causes produce like effects, they do so only under like conditions. The conditions which in this country favored the phenomenal development and diversification of industry during the period indicated, do not, and cannot, exist in Canada. She is not in any respect ready for a great industrial development. She has neither the capital nor the enterprise, and these will not be attracted to her cities and mining districts by the enactment of an experimental tariff which is not a political necessity—though it is the outgrowth of a political revolution—and which may not be permanent. If such a development is forced, it will be at the expense of other interests, notably the agricultural, which will be found a safer and more permanent dependence at present, and until her population shall have largely increased. That the enactment of a tariff designed to protect the manufacturers of the Dominion will seriously obstruct American trade with that country, cannot be denied. Whether it will ultimately benefit the Canadian consumer, as protection has benefited the

consumer in this country, is, at best, extremely doubtful. However, as we said before, this is their affair. Our manufacturers are not likely to sell out and go to farming in consequence of their action, nor is it probable we shall ever know how terrible a retribution our refusal to renew the reciprocity treaty has brought upon us. Canadian trade has been fairly profitable for some years past, and we have won in her markets a signal victory over British competition. Perhaps we shall not wholly lose the advantage we have gained, but if we should, it is some consolation to know that we shall probably be able to continue to pay interest on our national debt and make it pleasant for Canadian smugglers on our northern border.

## The Movements of Freight over the Pennsylvania Railroad for 1878.

The reports which the Pennsylvania Railroad have issued during the past few years, have been worthy of careful study by every manufacturer of iron. As we have so often said, the transportation problem is one of the most serious with which the iron-maker has to deal, and any information as to the cost of transportation and the direction of the movements of freight are of the utmost importance to him, as indicating the charges necessary for carriage, and also any changes in the centers of trade. On these subjects the reports have been very full, and any one by a little study can gain from them some important facts. The cost of transportation was discussed in last week's issue. In this we shall study the report in relation to the amount of freight moved and its direction.

The Pennsylvania Railroad, with its leased lines, is the shortest between the great trade centers of the West and the cities of New York and Philadelphia. To the seaboard it is much the shortest of any of the trunk lines. On the other hand, it is so situated that it should have its fair share of the freight that moves westward for the seaboard. Another fact to be borne in mind in studying the tables is that the line, for a long distance, passes through a country that is dependent for its prosperity on the iron and coal trades which have been so seriously depressed, and any increase of freight, especially local, must be taken as an indication of returning prosperity in these trades.

The main tonnage tables are the following, which show the movement of tonnage and the mileage of the same over the lines east of Pittsburgh and Erie for 1878, as compared with the previous year:

## TONNAGE MOVEMENT OVER LINES EAST OF PITTSBURGH AND ERIE.

	1878.	1877.	Inc.	Dec.
Maine line and branches	10,946,752	9,738,295	1,208,457	
United railroads of New Jersey	3,840,229	3,962,523	-122,294	
Philadelphia & Erie Railroad	2,810,460	2,681,439	129,016	
Delaware & Raritan Canal	1,521,530	2,023,443	-498,913	
Totals	10,121,977	18,405,711	1,337,473	621,107
Net increase			716,366	

## TONNAGE MILEAGE ON LINES EAST OF PITTSBURGH AND ERIE.

	1878.	1877.	Inc.	Dec.
Maine line & branches	1,730,003,131	1,494,798,198	Inc. 237,204,933	
United R. R. of N. J.	235,097,095	256,134,099	Dec. 1,107,004	
Phil. & Erie Railroad	981,300,202	335,727,141	Inc. 45,573,061	
Canal	63,477,228	93,800,450	Dec. 30,232,220	
Totals	2,431,807,656	2,180,459,888	Inc. 282,777,994	Dec. 31,435,220
Net inc.			251,347,768	

The first fact which a study of these tables discloses is that not only the tonnage, but the tonnage mileage, has largely increased. The number of tons of freight moved in 1878 over the main line and branches, including 680,476 tons of fuel and other materials for the company's use, was 11,627,228 tons, embracing 5,007,811 tons of coal. For the previous year, 10,438,394 tons were moved, showing an increase of 1,185,334 tons, or about 11 4-10 per cent., while the increase in coal tonnage was 53,919 tons. An inspection of the tables shows that the average haul of each ton of freight moved over the main line was 159 miles in 1878, against 153 in 1877, a very small increase in detail, but an enormous one in the aggregate, and important as indicating a possibility of decreasing terminal expenses per ton of freight.

It appears from other portions of the report, that of the 10,946,752 tons of freight moved over the main line, 1,783,543 tons only were through freight, and 9,208,209 local. This would give an average haul on the local freight of over 100 miles. This is an important fact, as showing that the earnings depend much less on through freight than upon local business which cannot be drawn away by competition, and which must be at its lowest point now, with the prospect that any change must be for the better.

One of the most important statements in this report not shown in the table, is that,

as compared with 1877, there has been a

large increase in through East-bound

freights and a falling off in through West-bound.

This is not only true of through

freight, but of local as well.

The East-bound local freights have increased and the West-bound local freights decreased. This is significant.

Telegraphic advices from various points of Pennsylvania report an alarming condition of affairs in that hitherto well-con-

ducted and orderly State. The following are examples:

READING, Pa., March 17.—It began raining here last night and continued until about noon to-day. All over the city can be noticed a strange yellowish deposit resembling sulphur, supposed to have come down with the rain. It has neither taste nor smell.

ALLENSTOWN, Pa., March 17.—There was found this morning beneath the snow which fell last night a substance, in some places half an inch deep, strongly resembling sulphur. It has the same color and smell, and a quantity of it scraped together and set on fire burned as readily and emitted the same fumes as sulphur.

IF we must have such displays of atmospheric foolishness, let us hope that in some future storm phosphorus will not be substituted for it, and can well dispense with showers of this inconvenient element, but when nature makes a beginning in this direction, it would be difficult to predict what she will do next.

Since the foregoing was written we have received the reassuring intelligence that the supposed sulphur has been found to be pollen from "The Pines" of New Jersey. This is certainly very gratifying, and all who are interested in the iron business will be greatly relieved.

## The Cost of Steel Rails.

The figures at which steel rails have been sold recently in England have caused much surprise, not alone in this country, but in iron circles in Great Britain. It seems a well-established fact that Messrs. Wilson, Cammell & Co., Dronfield, near Sheffield, made a tender, which was accepted, for 25,000 tons of Bessemer rails for the North Eastern Railway at either £4. 9/- or £4. 9/-—say at the largest figure, £21.48 per ton. This is only a fraction more than a ton of pig costs in this country, and not as much as the pig for a ton of rails costs at many works. Bolckow, Vaughan & Co., of Middlesbrough, tendered £4. 15/- and lost, of course. The latter firm are somewhat exercised over the loss of the order, as they believe they can make steel rails as cheaply as they can be made in England, and we have no doubt they are right; but their Sheffield competitors took the order.

To us in this country it seems well-nigh impossible that steel rails can be made at £21.48, unless there are some economies in their manufacture which we have not yet learned. The Eston Works of Bolckow, Vaughan & Co. are admirably and economically managed. The pig is run from the blast furnace to the converter, and the converter and spiegel furnaces are so arranged as to save waste in runners. The arrangements in the mill are also productive of great economy; but how even there the cost of a ton of rails can be brought down to about £22, is something we are quite unprepared to explain.

The recent statements of the French iron masters before the Commission on the Causes of Industrial Depression, throw some light on the question of cost of steel rails in Germany that are invaluable. M. Jordan, a director of the blast furnace company at Marseilles, stated that it was possible at Krupp's works to turn out a ton of Bessemer pig iron for 65f. @ 70f., and a ton of steel rails for 130f., first cost; or, at 19.3 cents to the franc, \$25.09. It is noteworthy, says the *Allgemeine Zeitung*, that the representative of Krupp's firm before the German Commission declined to give any information as to the cost of production. The other German rail manufacturers examined estimated their cost of production at 126 marks per ton, exclusive of general expenses. This would be \$30.25.

March 20, 1879.

Mexico, Cuba and Porto Rico. We must also make allowance for habitual preference. English capital and English engineers are running nine-tenths of all the great mining, agricultural and industrial undertakings managed by foreigners in countries beyond the seas, and it is but natural, as well as more convenient financially, to go to England for the machinery needed. The only countries in which American capital and engineers predominate are, so far as is known to us, Cuba, the Sandwich Islands, Porto Rico and northern Mexico. By degrees our markets, so far as machinery is concerned, will expand, especially in the sugar-producing countries and the mining districts of Mexico and South America. In sugar machinery, we believe we can fully compete with England, both in point of cheapness and excellence. The same is true of agricultural machinery, but we cannot now command the facilities which English exporters enjoy.

In locomotives, pumps and hoisting machinery it has been shown that, even in the remote Pacific countries, we can successfully compete with England, Germany and France, and we shall, in all likelihood, make considerable headway there in the near future. In Brazil, Peru and Chili, our products in these classes of machinery have also a fair future.

As for hardware and cutlery, our chances of successful competition are vastly better, and there is no country we know of where we may not make trade and keep it. We cannot afford to sell our products on the same terms as English goods have been sold in times past; but the English will be less ready in the future to extend facilities to remote countries, late experience having shown what an excessive liberality in the matter of credits leads to. The experience gained during the past few years has been fruitful in benefit to those interested in developing our foreign trade in manufactures, and one of the most important of the many things our manufacturers have learned, is not to attempt the impracticable. Where we can compete on equal terms we are doing it, and will continue to do so; where we cannot, we will not for the present seriously attempt it.

The troubles among the coal miners of the Monongahela Valley above Pittsburgh continue. The strike in this valley has been in progress for over three months, but is now virtually ended. A large number of the miners have been at work for some time at the old rates, 2½ cents per bushel, and nearly all the pits were to resume on Monday. Last week nearly 1000 of the striking miners encamped near Elizabeth, and sent detachments to the different works in operation, to endeavor to induce the miners who had begun work to suspend operations. The old statements are made regarding the purposes of these crowds. "They are law-abiding, quiet men," it is asserted, "who would not only disown any act of violence on the part of their fellows, but would, in the event of an outbreak, array themselves on the side of the law and assist the officers in suppressing acts of violence. The sole purpose of their meeting was to hold a friendly conference with the miners who were working for 2½ cents per bushel, with the hope of convincing the 'black sheep' that it would be to their interest to sustain the strike by standing out for 3 cents." The question arises, Why does it require a camp of 1000 men to hold a friendly conference with these miners, who are exercising their undoubted right to work for 2½ cents a bushel if they choose to? Whether this is a fair rate or not is a matter for the miners to decide for themselves. The trouble with such assemblies is that they too easily proceed to violence when talk fails. From friendly conference it is easy to pass to threats, and from threats to clubs and fire-arms. A camp of a thousand "law-abiding, quiet men," need little provocation to become a mob, and the provocation is not hard to find nor far from them. As we have before intimated, the authorities of Allegheny and neighboring counties are determined to prevent any illegal interference with the workmen in the pits.

We learn, through the kindness of Mr. Oscar W. Maddaus, of Riga, that the Baltic Exhibition, to which attention was drawn in a former issue of *The Iron Age*, has been postponed until 1880, on account of the plague in Russia.

## NEW PUBLICATIONS.

FIRST ANNUAL REPORT OF THE COMMISSIONER OF MINERAL STATISTICS OF THE STATE OF MICHIGAN. By Chas. E. Wright, Commissioner.

There seems to be of late a disposition on the part of State legislatures, for instance, those of Georgia and Alabama, to suspend the important work of studying local mineral resources and publishing the results. It is with pleasure, therefore, that we note the course of Michigan legislators, which has made the resumption of the work so ably conducted for many years by Major T. B. Brooks, possible. The appropriations for the work, it is true, do not seem to have been over liberal, and therefore it is creditable to the Commissioner, Mr. Wright, that he and those who have co-operated with him, have succeeded in accomplishing so much and doing it so thoroughly. We have in former issues of *The Iron Age* printed the statistics gathered and published by the commissioner, and will in the future give to our readers abstracts of the more important information embodied in the report which, as an introductory chapter, contains an essay on the geology of the Lake Superior iron region. Prof. Charles D. Lawton contributes a historical sketch of the iron region. Then follows a detailed description of the more prominent mines and openings of the region, with statistics of shipments, numerous sections, analyses, &c., constituting the body of the work. A second main portion is devoted to the Lake Superior copper,

per mining industry, its history, the geology of the region, and a description of the mines, with numerous data as to cost of working, &c. Smaller chapters are devoted to brown stone for building purposes, slate, granister, marble, gypsum and salt, the latter sketch being from the pen of Dr. S. S. Garrigues, State Salt Inspector. The work contains much important information, well arranged and therefore readily accessible. Its object, to be of practical value to all interested in the mineral resources of Michigan, has been well attained, and we hope that the general recognition of the value of the labors of the commissioner, may induce the State authorities to tender enlarged facilities for the accomplishment of the work still to be done.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING ENGINEERS. Vol. VI. May, 1877, to February, 1878.

It is natural that the growing importance of the American Institute of Mining Engineers—now one of the largest and most influential scientific associations of the United States—should reflect very favorably the character of the work performed under its auspices. It cannot and does not pretend to lead the progress of investigation and experiment, but it affords to all interested in metallurgy and mining an admirable means for the interchange of practical experience and a discussion of theoretical deductions, which are of incalculable benefit to every progressive and thoughtful engineer. With the growth of the Institute the papers submitted to it have been multiplied and diversified, so that each succeeding volume of transactions published by it has become a more important contribution to technical literature. Of the large number of the papers read, those of interest to the readers of *The Iron Age* have been printed in our columns, either in full or in the shape of careful abstracts, during or soon after the sessions at which they were read, as, for instance, Mr. A. L. Holley's paper on the "Strength of wrought Iron, as Affected by Its Composition and by Its Reduction in Rolling," Mr. T. F. Witherbee's "Fluxing of Siliceous Iron Ores," Mr. John Birkinbine's "Notes upon the Drainage of a Flooded Ore Pit at Pine Grove Furnace," Mr. P. Barnes' "Notes upon the Construction of the Converting Works of the Edgar Thomson Steel Works," Mr. E. F. Loiseau's paper on the "Manufacture of Artificial Fuel at Port Richmond," Mr. A. L. Holley's "Notes on the Iron Ore and Anthracite Coal of Rhode Island and Massachusetts," Prof. Egleston's "Copper Mining on Lake Superior," Mr. John M. Hartman's paper on "Fire-brick Stoves for Blast Furnaces," and the valuable report of the committee on a standard wire gauge.

The volume now before us contains, besides these, a brilliant essay on "Hydraulic Mining," from the pen of Aug. J. Bowie, of San Francisco, who has presented the most complete description yet published of this peculiarly American method of extracting gold from auriferous secondary deposits. Mr. Oswald Heinrich, a frequent and valued contributor to the transactions, has for the time being abandoned his accustomed field—bituminous coal mining—and gives in one paper an account of the prospects of the Godecker salt mine, and the difficulties encountered in sinking the shaft through a series of dangerous strata with the aid of iron tubing. He contributes also a long paper on the "Mesozoic Formation in Virginia," discussing it from a geological and economic point of view. Mr. Charles M. Rulker, of Reno, Nev., has a paper on the late operations of the Mariposa estate, and Prof. J. C. Simcock, of the Geological Survey of New Jersey, contributed an essay on the fire-clays and kaolins of New Jersey, a more elaborate and detailed account of which was published by the Survey, and noticed in *The Iron Age* at the time of its publication. Closely following one another, we find Mr. B. Fernow's and Mr. William Kent's papers referring to red charcoal. An excellent summary of the geological features of the Lake Superior copper district—its mines, the methods of mining and the cost—is contributed by Prof. Egleston, who has had exceptional facilities for studying the subject. A paper of high scientific merit is that of Prof. B. W. Frazier, of Bethlehem, Pa., on the "Mechanical Work Performed in Heating the Blast." A series of contributions on a subject which has given rise to one of the most famous expert discussions in the annals of American mining law, are those on the Eureka-Richmond deposits in Nevada, Messrs. W. S. Keyes, of San Francisco, and Dr. R. W. Raymond being the representatives of one side of the case, while Prof. Blake presented the other. "The Action of Small Spheres of Solids in Ascending Currents of Fluids, and in Fluids at Rest," by J. C. Bartlett, has a practical bearing upon the subject of coal-washing and ore concentration, which has of late years come so important a problem in many branches of American mining industry. Much valuable work has been done abroad in this matter, and therefore every attempt to render accessible to the large body of American engineers the accumulated experience of European experiments, has great value. Mr. John C. F. Randolph's elaborate description of Kutscher's dressing works, will therefore be welcome to many. Prof. Persifor Frazer, Jr., of Philadelphia, has presented a "New Classification of Coals" and an essay on "The Missing Ores of Iron."

From this enumeration, which only shows the cream of the volume, it will be seen how many branches of mining engineering and allied sciences have received their share of thought and discussion, though it is a curious fact that the metallurgy of steel has no representation in this year's volume. This is undoubtedly accidental, as in previous years steel absorbed much of the attention of the members of the Institute, and from present indications it is probable that a large portion of the seventh volume will be devoted to the subject of the chemical and physical properties of steel rails.

We notice with pleasure that Dr. Drown, the accomplished Secretary of the Institute, has added a complete index, not only of titles themselves, but of the topics discussed. This will greatly facilitate reference and make the volume more valuable. We congratulate the Institute on the volume before us, and on its prospects for the future.

## The Proposed Canadian Tariff.

Extracts from the Bill Prepared by the Finance Minister.

We find in the Ottawa journals the text of the proposed tariff bill, as submitted to the Dominion Parliament on the 13th inst. The arrangement of the items appears to be simply alphabetical, and we have had to pick out those of interest to our readers and arrange them in as good order as possible to facilitate reference. We are compelled to give our abstract with the customary qualification of "errors and omissions excepted," as we have not yet received an official copy of the text of the bill. The following are the items we find relating to matters which most directly concern our readers:

Broken, and bell metal, broken, fit only for manufacture. free

Tubing, seamless, drawn. 10%

Manufactures of, not elsewhere specified. 30%

Bullion—Gold and silver. free

Burstones—In blocks, rough or unmanufactured and not bound up into millstones. free

Carriages, wagons, sledges and wheelbarrows. 25%

Hubs, spokes, felloes. 20%

Coal—Anthracite, per ton of 1000 lbs. 50c

Bituminous, " " 50c

Pigs. Copper.

Bars, rods, bolts, ingots, sheets and sheeting, not polished or coated. 10%

Tubing, seamless drawn. 10%

Wire, round or flat. 10%

Rivets and bars. 10%

Manufactures of, not elsewhere specified. 30%

Old and scrap. 10%

Nails for sheathing. free

Precipitate, crude. free

Explosives. free

Gunpowder, in kegs, half kegs and quarter kegs, per lb. 50c

Cannon and musket powder, in kegs, per lb. 15c

Canister powder, per lb. 15c

Blasting and mining powder, per lb. 30c

Giant powder, dynamite, duolite, per lb, 5c, ad valorem. 10%

Nitro-glycerine, per lb, 10c, ad valorem. 10%

Glass and Manufactures of. free

Bottles, pressed, of all kinds. 30%

Carboys and demijohns. 30%

Fruit jars. 30%

Lamps and chimneys, lantern globes, lamp and gas shades. 30%

Insulators. 30%

Manufactures not specified. 20%

Iron and Manufactures of. free

Pig, per ton. \$2.00

Slabs, blooms, lumps, billets. 12½%

Bars, rolled or hammered, flat, rounds and squares, band and hoop, sheet, smoothed or polished, coated or galvanized, common or black, boiler and other plates, Canada plates or squares, nail and spike rods and all other forms not otherwise specified. 17½%

Round wire rods in coils, ½ inch diameter or less. 10%

Rails. 15%

Fish plates, frogs, frog points, chairs and finger bars. 17½%

Wire, iron or steel, No. 18 gauge or under. 25%

Castings, rough. 25%

Stoves and other finished castings. 25%

Car wheels. 25%

Forgings for mills or locomotives weighing 25 pounds or more. 20%

Mill iron, mill cranks. 25%

Locomotive engines. 25%

Mast and wire rigging for ships, chain cables. over ½ inch in diameter.

Scales, balances and weighing beams. 30%

Wood screws, iron or steel. 35%

French nails. 30%

Bolts, nuts, washers and rivets. 30%

Bedsteads and other iron furniture. 30%

Cast-iron hollow ware, tinned, glazed or enamelled. 25%

Hardware for builders, cabinet makers, carriage makers, sanders, upholsterers and undertakers. 30%

Boiler tubing, seamless drawn. 25%

Horse shoes and horse nails. 30%

Tacks and brads. 30%

Nails and spikes, cut, ¼ cent per lb, and ad valorem. 25%

Nails and spikes, wrought and pressed, galvanized and black, ¼ cent per lb, and ad valorem. 10%

Firearms, muskets, pistols, rifles, &c. 20%

Old iron and scrap, per ton. \$2.00

Lead. free

Pigs, blocks and bars, sheet, old and scrap. 10%

Pipe. 25%

Shot. 25%

Manufactures not specified. 25%

Machinery. free

Bookbinders' ruling machines. 15%

Steam engines and boilers, and other machinery of iron which iron is the component chief value, including machinery for cotton and woolen mills. 15%

Printing presses of all kinds. 15%

Steel and Manufactures of. free

Ingots, bars, coils and sheets. 10%

Shovels, spades, hoses, forks, rakes and rake teeth. 30%

Carpenters' and coopers' tools. 30%

Bookbinders' tools. 30%

Axes. 30%

Scythes, saws. 30%

Skates. 30%

Cutlery and other manufactures of steel not otherwise specified. 20%

## Special Notices.

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## LARGE TRADE SALE

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Furnishing Goods,  
WITHOUT RESERVE,

ON

WEDNESDAY, THURSDAY &amp; FRIDAY,

March 26, 27, 28,

At 10½ o'clock a. m. each day, at 83 Chambers  
and 63 Reade streets, New York.

## WEDNESDAY'S SALE, March 26,

Will comprise about 600 lots of French Tinned and  
Enamelled Ware, House Furnishing Goods, &c.,  
first and second quality, and direct from the  
manufacturers. Also, Wooden Ware, Cedar Tubs,  
Pails, &c.

## THURSDAY, March 27,

about 600 lots Shelf Hardware. Also, by order of  
an imitator, a large lot of German Hardware,  
including, in part, Flyers, Pinchers, Braces with  
and without bite, Files, Padlocks, Vises, Brass  
Goods, Dividers, &c., &c. Also, large line of  
Hatchets, Axes, Hammers, Wrought Narrow  
Butts, Bronzed Goods, Trowels, Brushes, Pulleys,  
Coat and Hat Hooks, &c. Also, a line of Birming-  
ham Sample Cards, &c.

## FRIDAY, March 28,

Second sale by order of the Cutlery Association of  
over 12,000 dozen Table Knives and Forks (seconds),  
comprising a large and desirable assortment.  
Also, 300 dozen American and German  
Pocket Knives, Scissors, Shears, Silver-plated  
Spoons and Forks (A goods), Casters, &c., &c.

Catalogues ready morning of sale.

## NOTICE TO MACHINISTS AND OTHERS.

CITY ENGINEER'S OFFICE, 1  
RICHMOND, VA., February 28, 1870.  
Proposals are invited until July 1, 1870, for fur-  
nishing the BEST DESIGNS of NEW PUMPING  
MACHINERY for the Richmond, Va., Water  
Works, for which premiums will be paid as fol-  
lows:

First best design, \$500.

Second best design, \$300.

Third best design, \$200.

The Committee of the City Council reserves the  
right to reject any and all designs.

For particulars, address the undersigned,  
W. E. CUTSHAW,  
City Engineer.

## FOR SALE,

Job Lots and Bankrupt Stocks Hardware.

Great bargains offered to the trade.

A. W. WHEELER,

141 Lake St., Chicago, Ill.

WANTED.—By an engineer with 7 years  
experience in the largest iron works of Ger-  
many, a position as manager or assistant manager  
of a blast furnace. He is thoroughly acquainted  
with the manufacture of Bessemer, Foundry and  
Forge Pig, as well as Spiegeleisen and Ferromagnes-  
eum, and is a good analyst. First-class refer-  
ences given. Address, R. S. Box 50,  
Office of *The Iron Age*, 83 Reade St., New York.

## TO LARGE CONSUMERS

of fine light  
MALLEABLE IRON CASTINGS,  
We can offer special inducements in the way of  
very superior quality guaranteed, and at fair  
prices. Being ourselves large consumers and re-  
quiring the most perfect castings, other work is  
ensured the same attention.

MALLORY, WHEELER & CO.,  
New Haven, Conn.

## FOR SALE.

Rolling Mill Machinery, &c.

Large and small trains of rolls for working  
Rounds, Flats and Squares, also for Nail Plate and  
Pipe Iron; Puddling Train, Burden Squeezers, Shears,  
Heating and Puddling Furnaces, Tools, Trucks,  
Scales, and all appliances belonging to a first-  
class Mill.

Inquire of  
GEORGE HOWELL,  
Camden Rolling Mills,  
Cooper's Point, Camden, N. J.

WANTED.—A position as superintendent of  
a foundry, to an engineer thoroughly acquainted  
with the business. Good references can  
be given. Address, B. Box 40,  
Office of *The Iron Age*, 83 Reade St., New York.

Wanted,  
A TRAVELING AGENT

For each of the States of  
New York,  
Ohio, and

Indiana,  
who is acquainted with the

CARRIAGE AND WAGON TRADE.

To the right one liberal terms will be offered.  
Address "B," giving correct name and age,  
Office of *The Iron Age*, 22 South Fourth St.,  
Philadelphia, Pa.

R. W. Cameron & Co.'s Pioneer Line  
FOR

AUSTRALIA, NEW ZEALAND AND THE EAST.  
ESTABLISHED 1852.

Freight forwarded to all ports in New Zealand,  
Also to Melbourne, Sydney, Adelaide and Brisbane  
in Australia. Cash advances made on approved  
consignments. For freight or passage apply to  
R. W. CAMERON & CO., 22 South William St., N. Y.

HARDWARE.

Any good house wishing to have their goods in-  
troduced to the retail trade or put into the hands  
of dealers on either commission or salary, can  
find party with ability to do it.

ORNAMENTAL BRONZE.

Office of *The Iron Age*, 83 Reade St., New York.

For full particulars, apply to

F. W. W. & CO., 148 W. Pratt St., Baltimore, Md.

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F. W. W. & CO





a day or two ago were at over \$21. With a less active demand in the West, and prospects of larger supplies with the opening of navigation, lower prices seem probable. We quote \$20 @ \$21.50, as to-day's quotations; market steady.

**Nails.**—The market is fairly active, and prices are held firm at \$2.10 for wholesale lots. Bids have been made for large lots at a slight concession from this figure, which holders decline to grant.

#### PITTSBURGH.

Office of *The Iron Age*, 77 Fourth Avenue, Pittsburgh, Pa., March 18, 1870.

While general business is not what it should be, it is, possibly, all that we could expect. In some branches of trade there is an active movement, while in others it is very slow; but the great and most serious cause of complaint is unremunerative prices. Some of our manufacturers, in view of what has just been stated, are doing as little as they possibly can. They have had no traveling salesmen out for some time past, and are refusing to make any large contracts, either for present or future delivery. Their policy is to supply the immediate wants of regular customers, in order to keep their trade. A great many of our manufacturers look upon traveling salesmen as an unmitigated nuisance, largely responsible for the cutting of prices, and they would gladly dispense with their services if it were made general. Many of these salesmen work on a commission; hence not infrequently, in order to effect a sale and make their commission, they will sell at or below cost, and thereby establish a price by which others have to be controlled if they want to do any business. There is no question but these travelers are to a considerable extent responsible for the unsatisfactory and unremunerative prices, but they appear to be, to a familiar expression, a necessary evil.

The recent improvement in the Iron business in the East has created a better and more hopeful feeling in the West, and, it is believed, will lead before long to better prices and stimulate business. If the feeling could be established that prices would advance before long, there would be a demand the like of which has not been experienced since before the panic, as buyers generally have been adhering closely to the policy of buying only as their immediate wants require, and consequently, as a rule, they have little or no stock. As long, however, as there is no advance, and buyers can see no probability of any, just so long will they adhere to the course to which reference has been made. It is not to be expected that they will anticipate future wants, while there is a possibility of a shrinkage in values. As nearly all the leading Pittsburgh manufacturers are being sold at if not below cost of production, we think there can be no risk in stocking up, as the cost of production has been reduced to the very lowest limit and is likely to be increased, and, moreover, many of our manufacturers have determined to stop their works and let them remain idle in preference to working for nothing.

Capt. Eads, the great marine engineer, while in the city yesterday, received a dispatch from the government inspector at the jetties reporting a depth of water of 25 feet. Also that the channel is 75 ft. in width at the narrowest place. The success of the jetties is assured, and its benefit to the Mississippi valley and tributaries is beyond computation. The foreign commerce of New Orleans is larger than ever before, and steadily increasing, and the consequence is that large quantities of grain, flour, &c., that heretofore has been exported from New York, Philadelphia, and Baltimore, is now being drawn to and exported from the Crescent City. Rates of freight from all points in the West and South by river to New Orleans are very low, and to this mainly, in connection with the jetties, may be attributed the largely increased business of that city. The shipped of a lot of Nails from here to New Orleans last week only offered 20 cents per keg freight, and we have no doubt it was taken. That was certainly a very low rate, as the distance by river is over 2000 miles. It may not be out of place in this connection to say that the people of the West and South are becoming thoroughly aroused in regard to the matter of river improvement, and the Congress of the nation will, no doubt, be asked for increased appropriations for this purpose at each session for years to come.

**Pig Iron.**—The tone of the market is stronger, with an increasing inquiry, and the volume of business is increasing. Several round lot sales have been made recently, some of which, for reasons best known to the parties interested, have been kept secret, while others have come to light. As stated in our report of last week, some furnaces have virtually been out of the market for some time past, as they refused to sell at prevailing rates; and standard brands, both of mill and foundry, have been held with considerable tenacity for some time past. Stocks, both in first and second hands, are comparatively light; and the furnaces, as a rule, have been working on contracts, hence there has been very little "filling up," while consumers for two or three years past have been buying only as their immediate wants required. The great fear of the producing interest is that an advance may lead to the starting up of idle furnaces, and that with an increased production the advance might not be maintained; however, we do not think there is any danger to be apprehended unless the advance is much greater than any one expects, as some of the idle furnaces, being behind the times and unfavorably located, will never be started up again, while others are in the hands of creditors and cannot "blow in" until matters are fully adjusted, which usually requires several years. Bituminous Coal Irons, \$18 @ \$20, 4 months, for foundry, and \$17 @ \$19.50 for Mill, outside figure for all-one Red-short. Bessemer is held at an advance, and standard brands are now held at \$21.50 @ \$22, 4 mos.; furnace, west of here, has sold its entire product until August at \$20, cash, delivered at furnace, equal to \$21.50, cash, delivered at Pittsburgh. Coke Irons firmer, with a sale of 1000 tons good neutral Mill

at \$16, cash, and 2000 do. strong neutral Mill at \$16.50, cash; ordinary may be quoted at \$16, cash, @ \$16.50 per ton. Eastern Cold Blast Charcoal, \$28 @ \$30. Anthracite, \$18.50 @ \$20, 4 mos., for Foundry, and \$16 @ \$17 for neutral Mill.

**Manufactured Iron.**—There is an increased firmness being developed in the market for all kinds of finished Iron, and while there has been no actual advance there are but very few, if any, sellers at inside rates, and, moreover, there is a general disinclination on the part of our manufacturers to make large contracts, particularly for future delivery, at ruling rates. Some of the mills are quite busy; we hear of one having orders booked for some 3,000 tons, and the indications are that orders will come forward pretty freely the remainder of this month and next. Then, again, since the upward turn taken in the East, Western mills will have very little, if any, competition from that direction for Western trade, as prices are much lower, relatively, in the West. The greatest drawback our mills have to contend with is the high cost of labor as compared with competing points; the cost of puddling should, in simple justice to our mills, be reduced to \$1.75 per ton. We continue to quote at 1.70 @ 1.75, 60 days, for Bars; 2.75 @ 2.85 for No. 24 Sheet; and 2.40 @ 2.50 for tank.

**Nails.**—There has been no change in the general status of the market during the past week; business continues very dull; some of the factories have been stopped for several months, while those in operation are not working more than half time. There is considerable inquiry, but as there are very few sales being made, it is evident that buyers are buying elsewhere or are not buying at all. Our manufacturers have very sensibly arrived at the conclusion that, however discouraging it may be, it is better to do nothing than work for nothing, hence business at present, notwithstanding this is usually the busy season, is very dull and neglected; and, what is still worse, the prospect for any immediate improvement is by no means encouraging.

**Rough Iron Pipe.**—There is rather more doing, and while prices are not better, a firmer feeling is being developed; manufacturers are refusing in some instances to take orders at very lowest rates. With a few weeks of fine settled weather, so that outside work can be started up, an increased demand is confidently expected. Discounts on Water, Steam and Gas Pipe still quoted at 35 @ 40 from new and 65 @ 70 from old list. Boiler Tubes, 45. Oil Well Casing and Tubing net.

**Horse and Mule Shoes.**—Unchanged. "Government" pattern, 100 keg lots, \$3.50 per keg for Horse and \$4.50 for Mule. "Roadster" pattern, \$3.75, cash.

**Railroad Spikes.**—Unchanged, with a continued fair demand; 2 1/2 @ 1/2 lb., 30 days.

**Steel.**—There is a continued steady demand; the mills generally are busy, and prices are decidedly firmer. As in the case of Iron, manufacturers are refusing to sell at a loss, and, from what we can learn, buyers cannot place orders now as they could have done a few weeks ago. Notwithstanding the Steel capacity is being increased, the consumption is also increasing, and as prices are firmer, it is evident that manufacturers expect a demand sufficient to absorb the entire product. Tool Steel may be quoted 10 1/2 @ 12 1/2; Machinery per 50 @ 95; Boiler Plate, 6 1/2 @ 7 1/2.

**Rails.**—Steel Rails are firm, with a sale of 300 tons at \$44, cash, delivered at mill. Steel Rail ends still quoted at \$28 @ \$32, according to lengths. Old Iron Rails continue quiet, and in the absence of sales we continue to quote at \$22.50 @ \$23.

**Scrap.**—The market continues moderately active, and there is a firm feeling, but prices remain about as last quoted. No. 1 Wrought Scrap, \$22.50 @ \$23, net; Boiler Scrap, \$23; Wrought Turnings, \$15; R. R. Car Springs, \$31; do. Axles, \$28; Old Car Wheels, gross, \$20 @ \$20.50; Railroad Metal, \$16; Cast Borings, \$11 @ \$11.50.

**Window Glass.**—At a meeting of the National Window-Glass Association in New York, on the 12th inst., which was largely attended, a slight change was made in the small sizes, equal to an advance of about 11 per cent., the remainder of the list remains unchanged; discounts also remain as before, 75 and 5 to 75 and 10 1/2 cent for car-load lots. Another meeting is to be held shortly, when an effort will be made to equalize freights, and this successfully accomplished the Window Glass trade will be in better condition than it has been for some time past.

**Coke.**—There is not as much inquiry apparently as there was about the first of the year, but the demand still appears sufficient to absorb the production, and the recent advance is still maintained—\$1.20 @ \$1.25 per ton, delivered free on cars at the ovens. It is reported that some of the furnaces west of here contemplate putting up ovens, and making their own coke; it is not so much the price of the coke as the cost of transportation, as the latter costs almost as much as the former.

**Coal.**—A good many of the miners are still on a strike; they are demanding 3 1/2 @ 2 bushel, while operators refuse to pay but 2 1/2; they are not only refusing to work themselves, but are endeavoring to prevent others from going in who want to work.

**Petroleum.**—This important interest continues very dull and neglected, but the probability is that there will soon be a change for the better. Exporters have been buying very sparingly all the year, and the demand for home consumption has fallen off considerably within the past few weeks. Most of the refineries here have stood idle since early in the winter, and they will not be started up until the export demand sets in; hence the consumption of the raw article has been very light all winter; and with no falling off in the production, there has been a steady and very decided accumulation of the visible supply, which is now placed at over five million barrels, and the daily average production last month is estimated at some 42,000 barrels. This being the case, it is not strange that prices, both of the raw article and the product, are very low; but just as soon as the demand for ex-

port fairly opens up we look for an improvement.

#### CHATTANOOGA.

Office of *The Iron Age*, Market and 8th Sts., CHATTANOOGA, March 15, 1870.

The weather during the past two weeks has been warm, almost summer-like. The thermometer the first days of the week just closing reached 70 to 72 degrees at noon, and suggested the shedding of winter garments. All early fruits are in bloom; roses are budding; early trees and shrubbery are putting out their foliage. Farmers are very busy with plowing and planting. Much corn is already in the ground. Oats are up. Winter wheat looks fairly well. The roads are dry and hard, the earth in excellent order for the manipulations of husbandry. The week ends cooler with threatening light frosts. The activity of the agricultural people abridges general trade to some extent, but it is no more equal to that displayed by Iron manufacturers in general. Trade west of this city is being cut by Western mills, but still prices hold up and become stiffer.

**Pig Iron.**—Business maintains the increased activity heretofore noted. Furnace men have but one answer to inquiries as to what they are doing: "We can't get any Iron ahead, and are selling as fast as we produce it, at fairly paying rates." Foundry grades continue scarce, as do also the lower grades of Charcoal. We make a slight advance on some of our last quotations. Coke Irons—No. 1 Foundry, \$17.50 @ \$18.50; No. 2, \$16 @ \$17; Gray Forge, \$14 @ \$15. White and Mottled, \$12 @ \$13. Hot-Blast Charcoal—No. 1 Foundry, extra, \$20 @ \$21; ditto, \$18 @ \$20; No. 2 Foundry, \$16 @ \$18; Gray Forge, \$16 @ \$18; White and Mottled, \$15. Cold Blast Charcoal—Car Wheel Metal, \$22.50 @ \$27.50; do, Extra Standard, \$24 @ \$29.50; Forge, \$17 @ \$22.

**Muck Bar.**—\$27 @ \$34. Old Rails, \$18 @ \$18.50. Old Car Wheels, \$18. Wrought Scrap, \$17 @ \$19.

**Ores.**—Brown Hematite, 50 to 56%; per ton, \$1.75 @ \$2.25. Red Fossiliferous, 50 @ 56%; per ton, \$1.20 @ \$1.60. The above prices for ores delivered in Chattanooga on cars, or on the wharf from flat boats.

**Nails.**—The mills here are running full, but the restricted field of operations, and the constant menace of Western mills to invade the market at prices below the cost of production and transport, keeps prices down to only living profits. We quote at \$2.25 rates, with usual discount on job lots. Sales have been made during the week above and below these figures.

**Manufactured Iron.**—The trade is good and improving steadily. There has been no advance sufficient to justify changing quotations, but, whereas three months ago the rule was to sell under the figures, it is now to maintain them strongly or go slightly above, especially on smaller lots. Bars, \$2; Railroad Spikes, \$2.50; Light Rail, \$2.25; Track Bolts, \$3; Trestle Bolts, \$4.

**Coke.**—Washed Foundry, 11 1/2 @ 15 1/2 per bushel, free on cars in Chattanooga. Furnaces in which are running full, with a sale in at \$22.50 @ \$23.

**Steel.**—There is a continued steady demand; the mills generally are busy, and prices are decidedly firmer. As in the case of Iron, manufacturers are refusing to sell at a loss, and, from what we can learn, buyers cannot place orders now as they could have done a few weeks ago. Notwithstanding the Steel capacity is being increased, the consumption is also increasing, and as prices are firmer, it is evident that manufacturers expect a demand sufficient to absorb the entire product. Tool Steel may be quoted 10 1/2 @ 12 1/2; Machinery per 50 @ 95; Boiler Plate, 6 1/2 @ 7 1/2.

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**Cleveland.**—CLEVELAND, March 17, 1870.

**Iron Ore.**—The outlook for the ore trade of 1870 is very encouraging. Considerably more ore has already been placed for delivery during the season than at this time last year. The advance in price, amounting to about 50 1/2 per ton, has been maintained. Business in ore has so far progressed that there is little doubt that the prices will continue throughout the season. The Republic Mine has sold over 70,000 tons; the Champion, Lake Superior and Jackson, 120,000 tons. The Barnum is reported sold up. The Michigamie also. The Salisbury hematite is all placed. Over 100,000 tons of ore from the new Menominee region have been sold to the makers of Bessemer pig iron. The Cambria Iron Company, Lucy Furnace Company, Cleveland Rolling Mill Company, and the furnaces at Chicago are the heavy purchasers of this ore. The prices at which sales have been made are: Republic, \$7.50; Champion, \$6.75; Lake Superior, \$6.50; Menominee, \$5.50 to \$6, varying with the units of metallic iron as shown by analysis. The hematites are reported to have sold at \$4.50, without concession. There will be less hematite for sale this season than for several years past. A number of the largest mines have been permanently closed. Look for a continuance of the present healthy tone of the ore market, with a steadily advancing firmness in all ores of hematite.

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**Pig Lead.**—4 1/2. Ingot Copper, 18 1/2.

**Iron.**—The mill here is filling considerable orders for new and rerolled, and will be engaged on these for some weeks.

**Steel.**—The Roane Steel Mill has turned out and shipped several hundred tons of Steel Bars, furnishing them to different roads rather as experimental lots. They have so far stood all breaking and bending tests applied equally well with selected specimens of Steel Bars from Pennsylvania mills. The company are preparing to extend their capacity for the production of ingots. There is not yet sufficient market to justify quotations.

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**Iron Ore.**—The outlook for the ore trade of 1870 is very encouraging. Considerably more ore has already been placed for delivery during the season than at this time last year. The advance in price, amounting to about 50 1/2 per ton, has been maintained. Business in ore has so far progressed that there is little doubt that the prices will continue throughout the season. The Republic Mine has sold over 70,000 tons; the Champion, Lake Superior and Jackson, 120,000 tons. The Barnum is reported sold up. The Michigamie also. The Salisbury hematite is all placed. Over 100,000 tons of ore from the new Menominee region have been sold to the makers of Bessemer pig iron. The Cambria Iron Company, Lucy Furnace Company, Cleveland Rolling Mill Company, and the furnaces at Chicago are the heavy purchasers of this ore. The prices at which sales have been made are: Republic, \$7.50; Champion, \$6.75; Lake Superior, \$6.50; Menominee, \$5.50 to \$6, varying with the units of metallic iron as shown by analysis. The hematites are reported to have sold at \$4.50, without concession. There will be less hematite for sale this season than for several years past. A number of the largest mines have been permanently closed. Look for a continuance of the present healthy tone of the ore market, with a steadily advancing firmness in all ores of hematite.

**Pig Iron.**—The sales of Pig Iron have been large since the new year. There has been an unusual activity in all grades.

**Charcoal.**—The Charcoal brands seem to be the most in demand. Of the high grades, Nos. 3, 4 and 5, there is a marked scarcity. Makers are obtaining higher prices by from \$2 to \$3 per ton. The best kinds of strong Foundry Iron are also molding. An advance of 50 @ \$1 per ton is readily maintained. Mill Iron is in better demand, but prices have not advanced. No more concessions, however, are asked or allowed.

**Scrap Iron.**—All kinds of Scrap are scarce and in very active demand. Old Rails are in very limited supply. The market is firm at \$22 @ \$23. No. 1 Wrought

Scrap is firm at \$23. Old Wheels are not so steady, but there is not an over-supply.

#### BOSTON.

MAR. 15.—**Pig.**—There is a better feeling throughout the market, and on some descriptions an advance has been established. The net advance in pig Iron, from the lowest point, is \$1.50. A Boston dealer was in Philadelphia this week seeking a 100-ton lot of No. 1 X on spot for cash. The Allentown people named \$17.50 f. o. b., but would not leave the offer open till Monday. The Crane people would not even name a price, stating that they are sold way ahead. The Allentown have not made any contracts yet, and will not at present prices. The rail and bar mills are crowded with orders, and the steel rail mills are turning orders quickly. Sheet Iron continues to sell at 2 1/2 @ 3 1/2 per ton. Russia is quiet at 11 1/2 @ 12 1/2. We quote English Spring Steel at 7 1/2 @ 8 1/2 per ton; 8 1/2 @ 11 1/2 for German; 9 1/2 @ 10 1/2 for Machinery; 14 1/2 @ 15 1/2 for Cast; 10 1/2 @ 12 1/2 for Blister; 8 1/2 for American Spring; 13 1/2 @ 13 1/2 for Cast; 9 1/2 for Blister; 7 1/2 @ 8 1/2 for Machinery. In Plate Iron there continues to



## FOOT POWER BRACKET SAWs

Are now so much in demand that some of them are being sold in almost every town in the United States. Many dealers are doing a profitable Christmas trade on such goods at a time of the year when other business is usually dull. The two Saws shown in these cuts are the ones most in demand. We advertise them as for sale at the hardware stores, and they will be called for. We make a fair discount to the trade.

## LESTER SAW.

The NEW LESTER SAW is made of Iron, with all the working parts of Steel, and contains ALL KNOWN IMPROVEMENTS. It is a power saw, and is made in three parts, painted red and painted are either Polished or Japanned. We warrant the Saw to be just as herein stated, and we know it will give entire satisfaction, being a more expensive machine than those we have formerly made. It is a Scroll Saw with Tilting Table, for Inlaid work; arms 18 inches in the clear; clamp which will hold work of any thickness; speed, 100 strokes per minute; and a CIRCULAR SAW 2½ inches in diameter, with six Scups; Steel Drills of various sizes; an IRON WAYS and EMERY WHEEL, with wide and narrow rim. 5th. A TURNING LATHE, with IRON WAYS and Rest, Steel Centres and three Best Steel Turning Tools; length of Ways, 15 inches; distance between Centres, 9 inches; swivel, 3 inches; length of Slide Rest, 4½ inches; number of revolutions per minute, 700. Also, with IRON WAYS, Saw Blanks, Saw Driver, Extra Belt and two sheets of Designs, with a nice box for the small tools and a box for the whole machine. It is taken apart when shipped and packed in a box, but the working parts are all left in place and the frame is put together again by a single bolt.

Price for everything above named, \$8.00

The same without the Lathe and Circular Saw, \$6.00

When desired, we furnish with the Lathe a very nice Drill Chuck for working metal, and a Tail Stock, with Screw Centre, for \$2.00 extra.

## NEW ROGERS SAW.

This Saw is made entirely of Iron and Steel, except the Arms and Pitman. It is the latest Improved #3 machine in market, having the Scroll Saw with Tilting Table and Drilling Attachment, in common with other machines; and in addition a Bore blower, Saw Stop, counter balance of the arms, and a clamp, made adjustable in every way, so that the Saw can be set with perfect ease and sturdiness to any required tension.

Height of the Table above the floor, 32 inches | Diameter of Balance Wheel, 5 inches

Diameter of Belt Wheel, 12 inches | Length of Arms in the Cleave, 18 inches

Price, \$3.

MILLERS FALLS CO., 74 Chambers St., New York.

BAILEY WRINGING MACHINE CO.,  
No. 99 Chambers Street, New York.

MANUFACTURERS OF



Novelty and Excelsior Clothes Wringers, Novelty and Excelsior Carpet Sweepers.

## NATIONAL

## Horse Nail Co.

MANUFACTURERS OF

## FINISHED

[BRIGHT OR BLUED]



These nails are made of the best brands of NOR-WAY IRON, and are guaranteed to be equal to any in the market.

NATIONAL HORSE NAIL CO.,  
VERGENNES, VT.

HORACE DURRIE & CO., Agents,  
No. 97 Chambers St., New York

## ANVIL NAIL CO.

We desire to call the attention of the trade to our new manufacture of

## Steel Horse Shoe Nails,

made from metal prepared in the Martin-Siemens Furnace by our PATENT process, which produces a nail having all the requisites for a

## PERFECT HORSE SHOE NAIL.

The well-known desirable properties of a perfect nail are, that the POINT should be sharp, the SHANK stiff, to drive without crippling under the hammer, soft enough to clinch readily, while sufficiently tough to avoid all danger from the "drawing the clinch" or breaking the neck under the head. These properties we claim for the

## "ANVIL HORSE NAILS."

In the process of manufacture the metal is compressed under the head, which gives the nail great strength where it is required (between the shoe and hoof), and the cold rolling gives it a stiffness attained in no other way, while the quality of the metal used insures a clinch and point unsurpassed by any nail ever offered in the market.

Samples and prices sent on application.

ANVIL NAIL CO.,  
65, 67 and 69 Washington St., New York.A. F. PIKE,  
East Haverhill, New Hampshire,  
Manufacturer and Wholesale Dealer in

## Scythe, Axe, Knife and Hacks-

## STONES.

Factories at Haverhill and East Haverhill, N. H., and  
Glenwood and Westmore, Vt.

GENUINE OLD RELIABLE INDIAN BOND (Red Ends),

LETOILLE, DIAMOND GRIT,

WHITE MOUNTAIN, PREMIUM,

GREEN MOUNTAIN, RAGG,

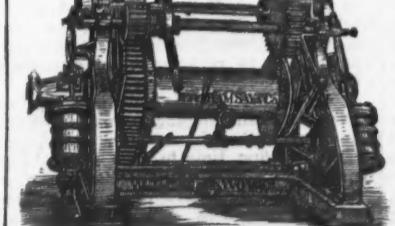
Stones gotten up and labeled in

any style desired.

MANUFACTURED.

All the above Stones are of good

ken grit and will not glaze.



The "Ramsay Improved Steam Winder,"  
Manufactured by H. A. RAMSAY & CO.,  
Vulcan Iron Works, Baltimore, Md.

Manufactured by

Crane Bros.

Mfg. Co.,

CHICAGO.

Established in 1839.

Formerly L. & A. G. COSS.

## L. COES &amp; CO.

Manufacturers of L. COES'

## GENUINE IMPROVED AND MECHANICS

Wide Bar Full Length.

Wide Bar Full Length.

## PATENT SCREW WRENCHES

UNDER PATENTS DATED

JUNE 26, 1866,  
MARCH 23, 1869,

NOVEMBER 10, 1863,  
FEBRUARY 23, 1864,  
REISSUED JUNE 1, 1869,  
IMPROVED AUG. 1, 1877.

The back thrust when in use borne by the SHANK instead of the Hand.

None genuine unless stamped "L. COES & CO."

## WORCESTER, MASS.

Warehouse, 97 Chambers St., & 81 Reade St., N. Y.  
HORACE DURRIE & CO., Sole Agents.



Firth's Best English Cast Steel.

## THE 1879 PENNSYLVANIA LAWN MOWER.

LIGHT DRAFT AND EASILY ADJUSTED.

Every Machine Warranted to Work as Represented.



Points Claimed as being Meritorious:

1. Lightness, combined with Strength in Construction.
2. Ease of Adjustment.
3. Ease in Securing and Adjusting the Handle.
4. The Least Liability to Obstruction from Clogging, either in short or (for a Lawn Mower) high Grass.
5. Lightness or Ease of Running while being worked.
6. The Attractive Appearance of the Machine.

It is the lightest machine in use, and all that is necessary to satisfy our customers of its superiority is to place it in competition with any other machine in the town in which they may reside.

## PRICE LIST.

Width of Cutter.	Style.	Driving Wheels.	Power required.	Weight.	Price.
10 inch.	8 inch.	A Child.	30½ lbs.	\$14.00	
12 "	8 "	A Lad.	33½ "	18.00	
14 "	8 "	A Lady.	36 "	20.00	
16 "	8 "	One Man Size.	38 "	22.00	
18 "	8 "	"	41 "	24.00	

## NEW MACHINES.

15 inch, 10½ inch Driving Wheels, 6½ inch Cylinder, Man Size, 45 lbs.	\$22.00
17 inch, 10½ inch Driving Wheels, 6½ inch Cylinder, Man Size, 51 lbs.	24.00

## GENERAL AGENTS:

LLOYD, SUPPLEE & WALTON, 625 Market Street, Philadelphia.

HORACE DURRIE & CO., 97 Chambers and 81 Reade Streets, N. Y.

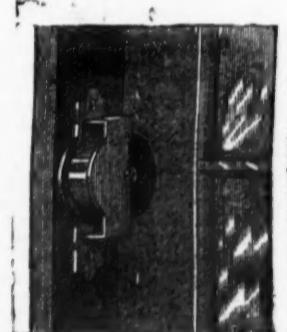
## PATENT

## ANTI-WINDOW

## RATTLES,

FOR

Dwellings, Cars, Steamboats, &c.



The Anti-Window Rattle supplies a long needed want; it is so simple in construction that it can be used on any window, and so complete that it will prevent the slightest shaking, no matter how great the jar or how old the sash. As shown in cut, it consists of a rubber wheel in a nickel-plated or brass frame; is ornamental as well as useful, and does not interfere with raising or lowering the sash.

HEATON & DENCKLA,

General Agents,

507 Commerce St., Philadelphia.

GRAHAM & HAINES,

Agents,

113 Chambers St., New York.

OTIS D. DANA,

Agent,

26 to 32 Pearl St., Boston, Mass.

## LANE'S MEASURING FAUCET.

Price, \$3.00.

For Light or Heavy Molasses, Oils, Varnishes or other Fluids.

We warrant these Faucets to be as represented, measuring correctly and working more easily in heavy molasses than any Measuring Faucet in the market. No greater convenience can be obtained for a given time, and "time is money." They insure perfect cleanliness, requiring no tin measures or funnel to collect dirt and draw water, and no drip, no water waste, as no molasses or other fluid can pass except when the crank is turned. They are the embodiment of simplicity, and consequently they are always in order. They work easily in the heaviest molasses. They are warranted to measure correctly, according to U. S. Standard.

MANUFACTURED EXCLUSIVELY BY

LANE BROTHERS, Millbrook, N. Y.

General Agency, GRAHAM & HAINES, 113 Chambers St., New York

Send for circulars.

JOHN ADT,  
90, 92, 94 and 96 Artisan Street, New Haven, Conn., U. S. A.

Automatic Machines for Straightening and Cutting Wire of all sizes to any length.  
Automatic Machines for Cutting and Forming Wire in various shapes.

ALSO  
HARDWARE MANUFACTURERS' TOOLS.  
Send for circulars.



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1	Elevators, Makers of.
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# AMERICAN SCREW CO.,

Providence, R. I.,

## MANUFACTURERS OF MORE THAN 4000 VARIETIES OF PRODUCT,

AND INCREASING THE ASSORTMENT DAILY.

Machinery employed contains important inventions recently patented, and which are designed to produce Screws at a **lower cost to the consumer** than has ever been attained.

All goods are distributed through the Hardware trade, to whom a liberal discount will be allowed.

### INTERNATIONAL EXHIBITION.

PHILADELPHIA, 1876.

The United States Centennial Commission has examined the report of the Judges, and accepted the following reasons, and decreed an award in conformity therewith.

#### REPORT ON AWARDS.

Product: Iron, Brass and Steel Screws, Tire and Stove Bolts, Rivets.

Name and address of Exhibitor: American Screw Company, Providence, R. I.

The undersigned having examined the product herein described, respectfully recommends the same to the United States Centennial Commission for Award, for the following reasons, viz: Being of a quality nearly approaching perfection, showing the highest attainment in this branch of manufacture.

G. L. REED. Signature of the Judge.

Approval of Group Judges.

Daniel Steinmetz,  
Jas. Bain,  
Chas. Staples,

G. L. Reed,  
J. D. Imboden,  
Dav. McHardy

A true copy of the record. FRANCIS A. WALKER, Chief of the Bureau of Awards.  
Given by authority of the United States Centennial Commission.

A. T. GOSHORN, Director-General.

[L.S.] J. L. CAMPBELL, Secretary.

J. R. HAWLEY, President.

PHILADELPHIA, November 8, 1876.



After forty years' experience we offer to the trade our Centennial Screws, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at the same price as the old style screw.

The new screws will be packed in manila colored boxes with the new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade-mark, which is also secured to us.

The accompanying engravings show the progress of making screw from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all

the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated. See sections at lines.

#### CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."



1776.



1846.  
Patented August 30.

Section at Line A B  
Section at Line C D  
Section at Line E F



1876.  
Patented May 30.  
COVERED BY TRADE MARK.

Section at Line A B  
Section at Line C D  
Section at Line E F

Estimated to be FIFTY PER CENT. stronger

# HENRY DISSTON & SONS

## KEYSTONE SAW, TOOL,



## STEEL and FILE WORKS,

Front and Laurel Streets, Philadelphia,

MANUFACTURERS OF

### SAWS OF ALL KINDS, FILES AND TOOLS, AND SPECIAL GOODS MADE FROM SHEET STEEL.

All goods stamped Henry Disston & Sons, and bearing our trade mark, are fully warranted.

Branch Works, Tacony, Philadelphia.

Branch House, Randolph & Market Streets, Chicago, Ill.

## NEW EXCELSIOR LAWN MOWER

Received the Highest Award at the Centennial Exposition.

### Important Features

FOR THE

SEASON OF 1879:

### REDUCTION IN PRICE,

Three Styles Hand Mowers:

ROLLER,

BACK WHEEL and

SIDE WHEEL.

Less Weight

Lighter Draft.



Address

CHADBORN & COLDWELL MFG. CO., Newburgh, N. Y.

Send for Circulars.

Steam and Frost prevented on Show Windows.



### REVOLVING VENTILATORS

For everything (and every size), from a hat or cap to an exhibition building. Kitchens, Laundrys, &c., ventilated without draft. Durable, strong, without rivets or solder. Oiled for six months. Each one has storm cap. Retail price, size six inch diameter, \$1.00 and upwards; apparatus with which any one can cut circles in glass, 15 cents each.

Protective Ventilators avoid drafts, exclude dust, dampness, malaria and germs of disease; adopted by hospitals, schools, institutions, &c.; applied to any window or room.

Prof. A. J. LOOMIS, M. D., University of the City of New York, writes as follows:

Dear Sirs—In my opinion, as far as the air in my patient's room is concerned, your Ventilator during the past six months, I am convinced that your method of removing dust, impurities and dampness from the atmosphere is the best which has as yet been proposed. By it the air in an apartment can be constantly changed without causing drafts. I would especially recommend its adoption in sick rooms, sleeping apartments, nurseries, school rooms, &c.

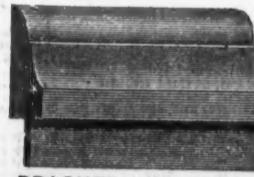
Air Filters and Moisteners, placed over hot-air registers of furnaces, &c., prevent dust and supply steam filtered air. Prices and discounts to the trade sent on application.

The "Economy" Molding Weather Strip is perfect in every respect. By enlarging edge of rubber or felt, and making slot in molding to correspond (see engraving) we save all extra expense of molding. Once purchased it will last a lifetime. It can be easily removed by taking off one piece out of either end of molding, and sliding in a new piece. By this method of securing it, there is no uncertainty of fastening or undoing of the seal. It is durable and strong.

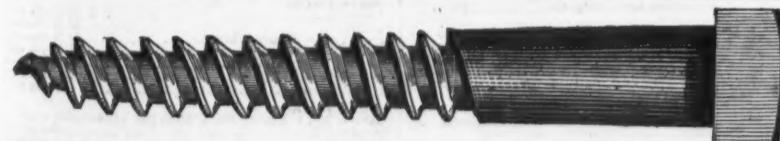
Rubber supplied with enlarged edge and instructions to enable Car Manufacturers, Carpenters, Builders and far off trade to make slots in Sashes, Doors, Moldings, &c., and thus make perfect Weather Strips.

Steam Filtered air. Prices and discounts to the trade sent on application.

No. 6.



BRACHER VENTILATOR CO., No. 3 Park Row, New York.



WM. H. HASKELL & CO.

Pawtucket, R. I.,

MANUFACTURERS OF

### COACH SCREWS

(With Gimlet Points),

ALL KINDS OF

Machine and Plow Bolts,

FORGED SET SCREWS,

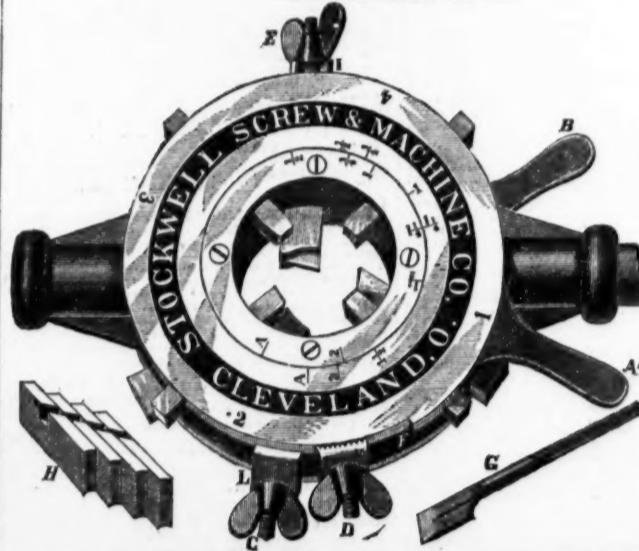
AND

TAP BOLTS.



### MAGIC SCREW PLATE.

MANUFACTURED BY THE



Send for catalogue and price list.  
Size A threads bolts from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch.  
Size B bolts from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch.  
No. 1 cuts off and threads pipe from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch.  
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# SCHOVERLING, DALY & GALES,

Successors to SCHOVERLING & DALY, and SPIES, KISSAM & CO.,  
**IMPORTERS' AND MANUFACTURERS' AGENTS,**  
 84 and 86 Chambers Street, and 279 Broadway,  
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Have the best line of GUNS and REVOLVERS in America,  
 especially for the Jobbing Trade.



### STANDARD ARMS CO. BREECH LOADERS, Side and Top Action.

This NEW BRAND is made by one of the first-class English makers, EXPRESSLY FOR US, and is intended to meet a want long felt in the trade, that is, for a RELIABLE, WELL MADE, CLOSE SHOOTING GUN, at a LOW PRICE. Every Gun is CHOKED BORED on scientific principles. They are equal to American Guns, and will pay the dealer a better profit.

Sole Agents for

## BALLARD RIFLES.

Daly, Clabrough, Standard and Scott's Breech-Loading Guns; the Standard, Harrington & Richardson, Colt, Aetna, Napoleon and Victor Revolvers.

Send for Illustrated Price Lists. Please inclose your business cards.

PHOENIX CASTER COMPANY, Indianapolis, Ind.



Our different sizes of casters are adapted for use as designated below  
 No. 2. For parlor chairs and other very light furniture.  
 No. 3. For invalid and office chairs, extension and other light tables, rope reels, flower stands, &c.  
 No. 4. For bedsteads, &c., &c.  
 No. 5. For heavy bedsteads, book cases, flower stands, refrigerators, safes, sideboards, desks or very heavy furniture.  
 No. 6. For pianos extra heavy sideboards and bookcases.  
 No. 8. For show cases, light store trucks, ice chests, heavy refrigerators, heavy flower stands, &c. Especially useful as a truck under sample stoves or any heavy sample goods.  
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 No. 14, warehouse trucks, or for carrying any immense load.

Send for illustrated catalogue.

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Manufactured by  
 Tucker Alarm Till  
 Manuf'g Co.  
 INDIANAPOLIS, IND.

October 1st  
 1878.

Adjustable  
 STOVE TRUCK.  
 Send for Illustrated Catalogue.

TUCKER & DORSEY,

Manufacturers of Tucker's Incomparable Adjustable Stove Trucks and Tucker's

Alarm Money Drawer, Indianapolis, Ind.

Simple, Cheap,  
 Light. I

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# WIRE NAILS

French Points, Window Shade Nails,  
Upholstering, **WAGON NAILS**, Molding Nails,  
Electrotype, Roofing Nails,  
Barbed Caster Nails.

Veneer Nails, Label Tacks and small Nails of all kinds, Cabinet Nails, Barbed Lock Nails, Cigar Box Nails, &c., &c., put up in bulk, 5 lb. packages, 1 lb. papers, or as wanted.

**AMERICAN WIRE NAIL CO.**  
Factory, Fifteenth and Madison Sts.  
COVINGTON, KY.

ESTABLISHED IN 1859.



PUBLISHED EVERY SATURDAY.

THE OLDEST AND CHIEF REPRESENTATIVE OF THE IRON, HARDWARE AND METAL TRADES.

OFFICE: 44a CANNON STREET, LONDON, E. C.

ADVERTISEMENTS AND SUBSCRIPTIONS ARE RECEIVED AT THE VARIOUS OFFICES OF "THE IRON AGE," NAMELY:

NEW YORK OFFICE: DAVID WILLIAMS, Publisher of *The Iron Age*, 83 Reade street.

PITTSBURGH OFFICE: 77 Fourth Avenue—JOS. D. WEEKS, Manager and Associate Editor.

CINCINNATI OFFICE: Merchants' Exchange—T. T. MOORE, Manager.

PHILADELPHIA OFFICE: 220 South Fourth Street—THOMAS HOBSON, Manager.

SOUTHERN OFFICE: Cor. Eighth and Market Streets, Chattanooga, Tenn.—S. B. LOWE, Manager.

## EXTRA SPECIAL ISSUE OF 12,000 COPIES.

Extraordinary Miniature Edition.

ON APRIL 5th NEXT, THE HALF-YEARLY

## Special Issue of "The Ironmonger"

WILL TAKE PLACE,

With a Guaranteed Home, Foreign and Colonial Circulation of not fewer than

**12,000 COPIES,**

PRINTED IN MINIATURE BY PHOTO-LITHOGRAPHY, IN ADDITION TO THE USUAL CIRCULATION.

Will be sent to every leading Ironmonger, Implement Dealer, Hardware Vender, Exporter and Importer, throughout the entire civilized world. The names on our list are the accumulation of over twenty years' experience, and are exclusively known to ourselves.

American manufacturers who desire to extend their foreign connection, and thereby to increase their sales, cannot possibly resort to a surer or better method of securing that end than by advertising in *The Ironmonger*, and particularly in the SPECIAL ISSUE, announcements and blocks intended for which may be handed to any of the offices of *The Iron Age*, or may be forwarded to us direct, to reach us in either case not later than the end of March, 1879. It is especially recommended that good blocks should be used, as American engravings for this purpose are frequently so much better executed than English ones that they invariably attract more ordinary attention, and are, therefore, so much the more valuable as advertisements.

Advertisements intended for insertion in our SPECIAL ISSUE only will be charged:

One whole page.....	\$50.00
Two-thirds of a page.....	37.00
Half a page.....	27.50
One-third page.....	20.00
Quarter page.....	16.00
One-sixth page.....	11.30
One-eighth page.....	9.00
One-sixteenth page.....	5.00

It will be seen by reference to our ordinary rates (printed in this advertisement weekly) that a page ordered for seven insertions is charged \$22.50 each time only; a half page, \$16.00 each; and so on. One of the insertions at these rates may be in the Special Number.

## THE FOREIGN SUPPLEMENT

Is published every fourth week in connection with the extensive and world-wide circulation of *The Ironmonger* itself. The dates of its publication in 1879 will be as follows:

JANUARY 11, FEBRUARY 8, MARCH 8, APRIL 5, MAY 3 and 31, JUNE 28, JULY 26, AUGUST 23, SEPTEMBER 22, OCTOBER 18, NOVEMBER 15, DECEMBER 13.

This Supplement is published in

### FIVE LEADING COMMERCIAL LANGUAGES

of the world, including English, and is sent to all the countries where they are spoken, thus placing the contents of *The Ironmonger* not only within reach out in the native language of eighty millions of German, forty-two millions of French, twenty-eight millions of Italian, and fifty-one millions of Spanish speaking people; or, in all, over two hundred millions of inhabitants in the principal nations where the best purchasers of manufactured goods are to be found.

## SPRING HINGES

WITH  
Patent Anti-Friction Springs,  
FOR  
SCREEN DOORS.

PRICE LIST.—Per Dozen Pairs.  
SINGLE JOINT HINGES.  
(To Swing one way.)

SIZE.	WITHOUT ACORN TIPS.		WITH ACORN TIPS.	
	BRASS.	NICKEL PLATED.	BRASS.	NICKEL PLATED.
2 1/2 inch.....	\$ 3.00	\$ 4.50	\$ 5.00	\$ 6.50
3 " "	4.50	6.50	6.75	8.75
5 " "	7.50	10.00	10.00	12.50

## DOUBLE JOINT HINGES.

(To Swing both ways.)

To be used on Door 1 inch thick, or less.

SIZE.	WITHOUT ACORN TIPS.		WITH ACORN TIPS.	
	BRASS.	NICKEL PLATED.	BRASS.	NICKEL PLATED.
2 1/2 inch.....	\$ 6.60	\$ 9.00	\$ 11.50	\$ 14.25
3 " "	8.30	11.50	13.50	17.00
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The large cut represents full size of our 5-inch Double Joint Acorn Tip Hinge for mortising. The small cut represents the plain Single Joint Hinges, but not full size.

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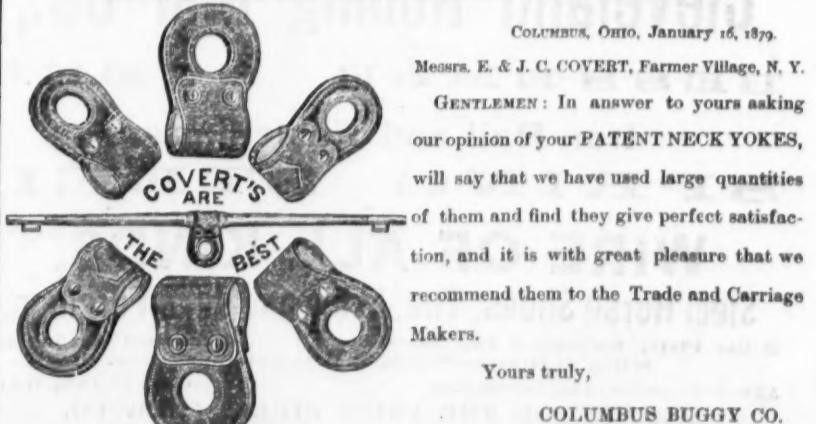
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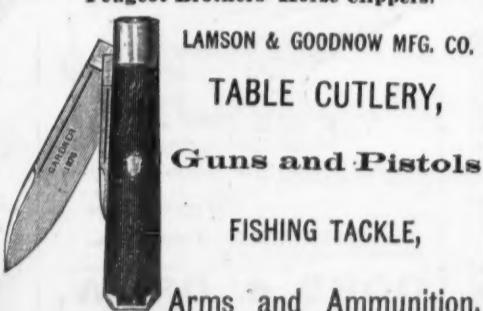


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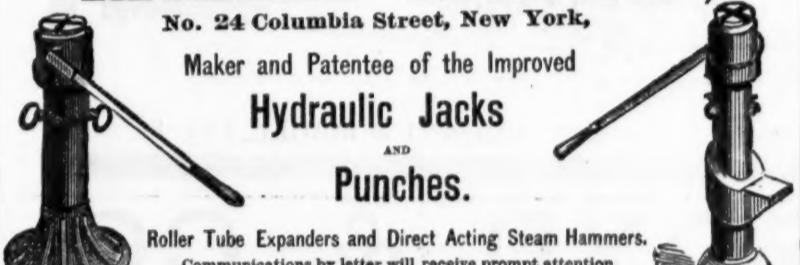
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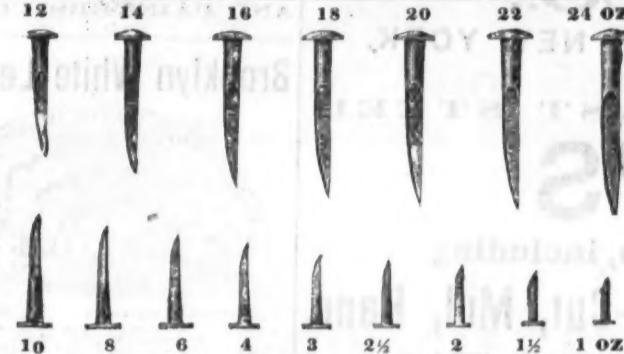
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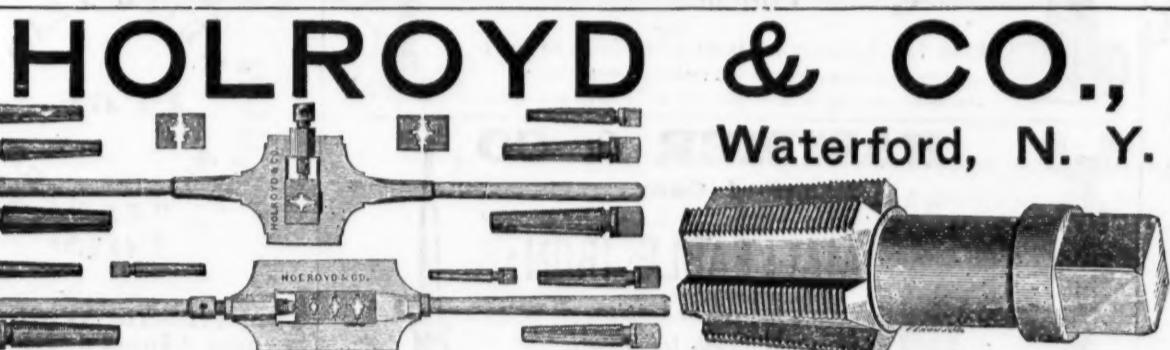
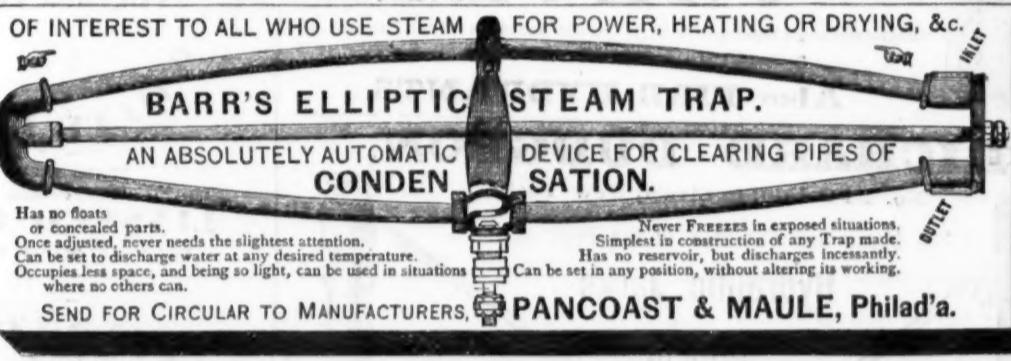
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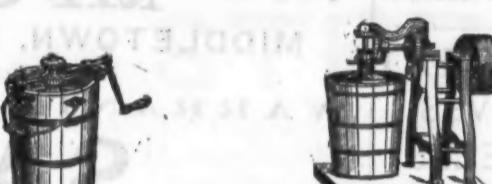
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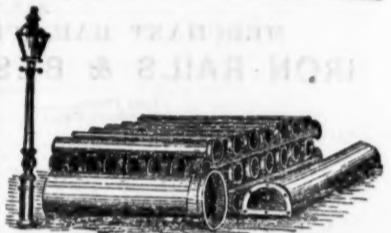
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FOR WATER AND GAS.  
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The most perfect Dinner Pail in the world for coffee for dinner and a Lantern at night.

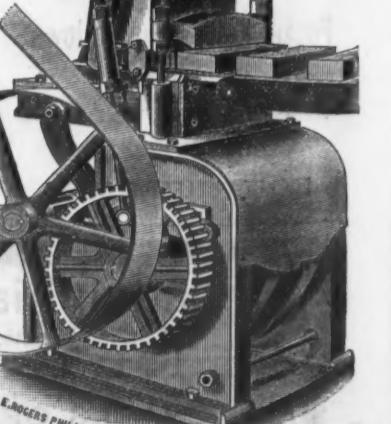
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The above is a cut of Gregg's No. 2 Brick Machine, simple, strong and efficient, for making and  
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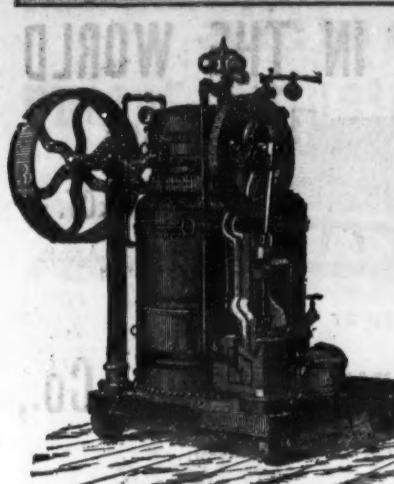
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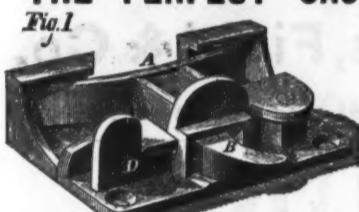
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For either Wire or Rope Line,  
Will securely hold any article, from a silk handkerchief to a carpet. No article can be blown away. Does not soil the clothing. Manufactured by

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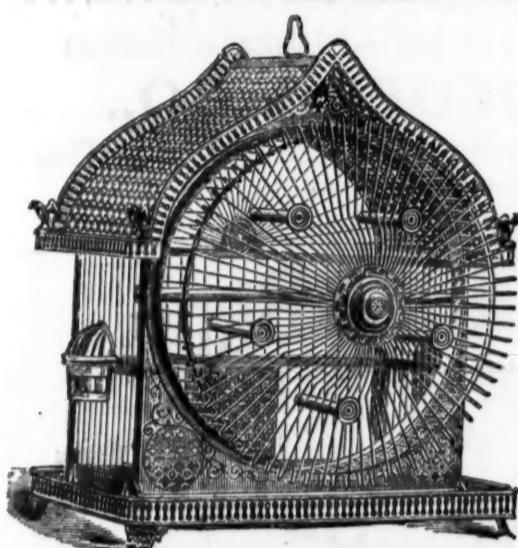
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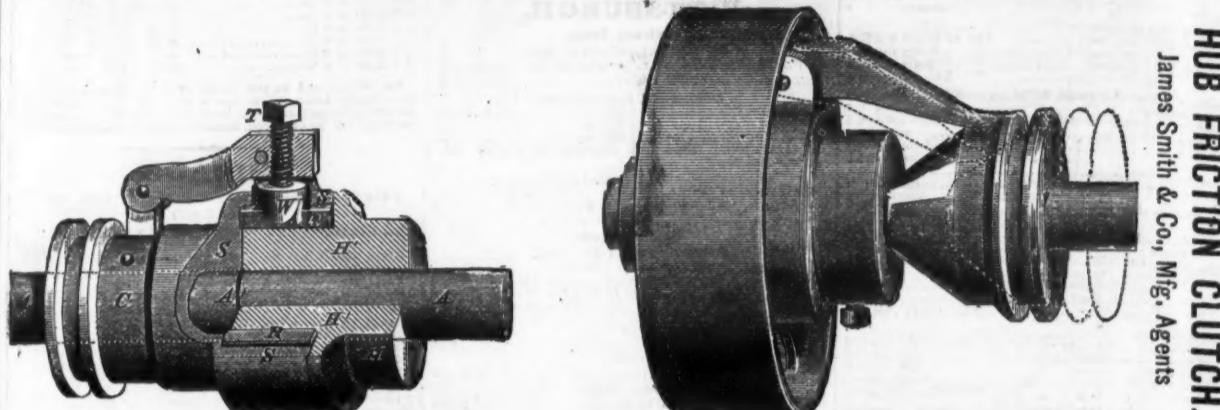
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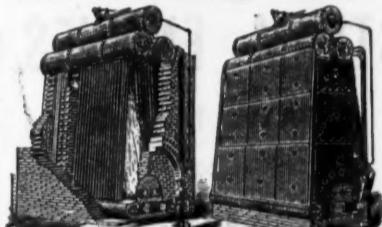
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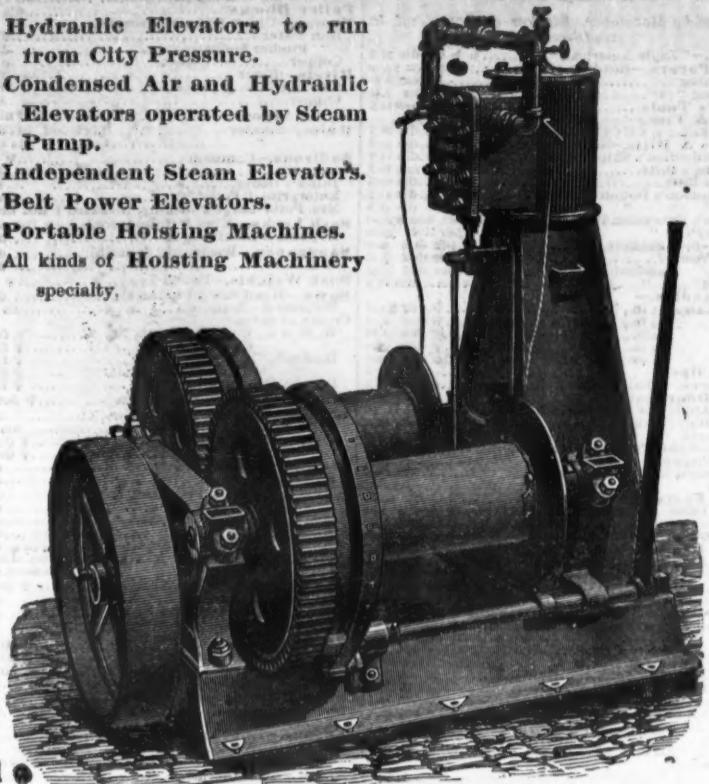
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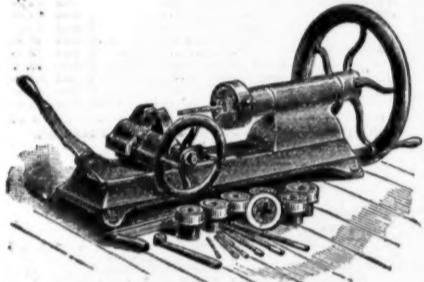


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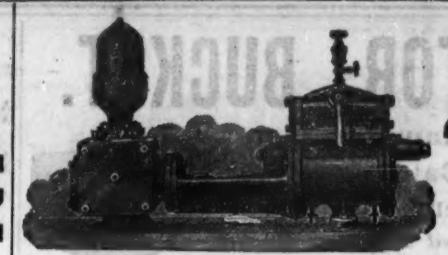
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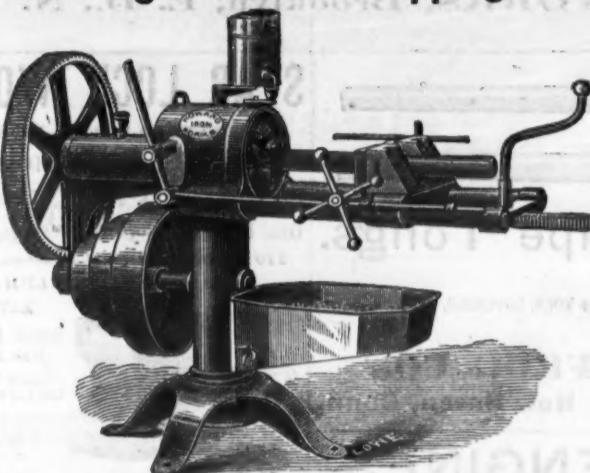


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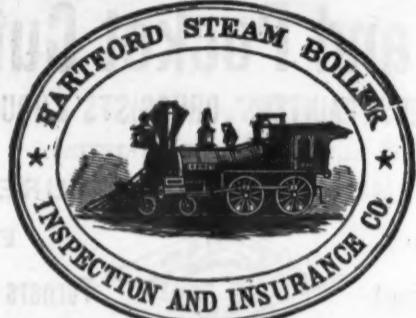
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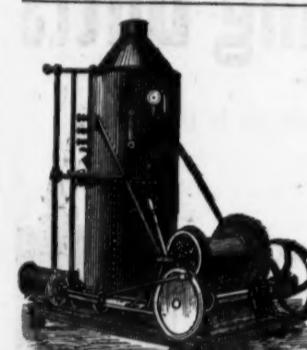
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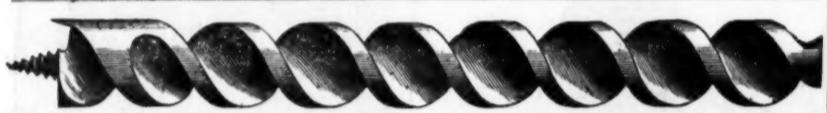
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